US009469118B2

(12) **United States Patent**
Kimura et al.

(10) **Patent No.: US 9,469,118 B2**
(45) **Date of Patent: Oct. 18, 2016**

(54) **TANK**

(71) Applicant: **SEIKO EPSON CORPORATION**, Tokyo (JP)

(72) Inventors: **Naomi Kimura**, Nagano (JP); **Munehide Kanaya**, Nagano (JP)

(73) Assignee: **Seiko Epson Corporation**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/935,702**

(22) Filed: **Nov. 9, 2015**

(65) **Prior Publication Data**

US 2016/0263900 A1 Sep. 15, 2016

(30) **Foreign Application Priority Data**

Mar. 12, 2015 (JP) 2015-049479

(51) **Int. Cl.**
B41J 2/175 (2006.01)
B41J 2/17 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/1752*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/17513; B41J 2/17523; B41J 2/17553; B41J 2/17556; B41J 2/17596; B41J 2/17566; B41J 2/175; B41J 2/17506; B41J 2/17503
USPC 347/7, 19, 84, 85, 86
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

8,678,567 B2 * 3/2014 Shimizu B41J 2/17523 347/85
2013/0321534 A1 * 12/2013 Ishizawa B65B 3/04 347/85
2015/0109386 A1 * 4/2015 Koike B41J 2/17503 347/86
2015/0210081 A1 * 7/2015 Suzuki B41J 2/175 347/86

FOREIGN PATENT DOCUMENTS

JP 05-131646 A 5/1993
JP 2014-184594 A 10/2014

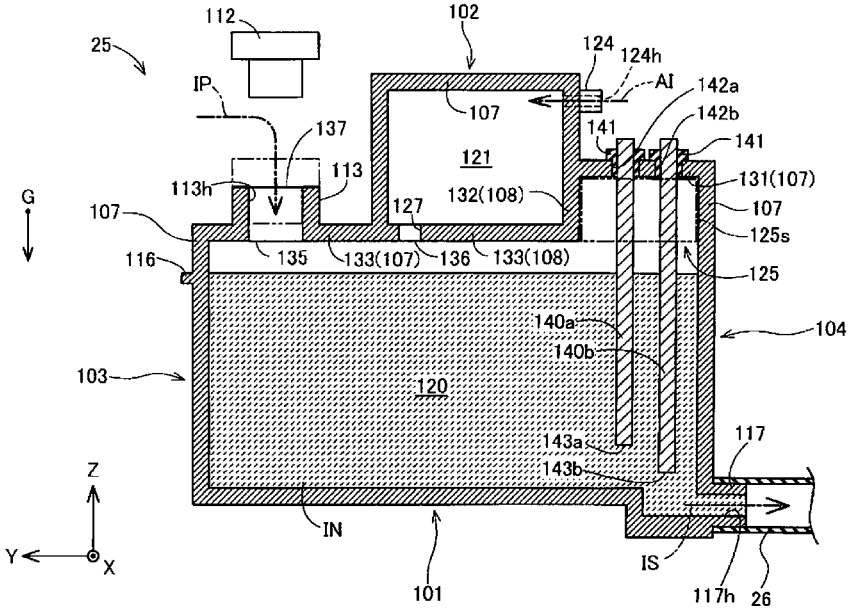
* cited by examiner

Primary Examiner — Jannelle M Lebron
(74) *Attorney, Agent, or Firm* — Global IP Counselors, LLP

(57) **ABSTRACT**

Provided is a technique for restraining leakage of a liquid from a tank. An ink tank **25** is provided with an ink injecting part **113**, an ink container **120**, an atmospheric air introduction part **121**, and electrode pins **140***a* and **140***b*. A recess **125** that is open downward in the gravity direction when the ink tank **25** is in a posture when ink is supplied to a printing head part **32** is formed in the ink container **120**. The electrode pins **140***a* and **140***b* are provided in a first upper wall part **131** constituting an upper end wall part of the recess **125**. In addition, an ink injection port **135** of the ink injecting part **113** and an atmospheric air introduction port **136** of the atmospheric air introduction part **121** are provided outside the recess **125**, in the ink container **120**.

15 Claims, 17 Drawing Sheets



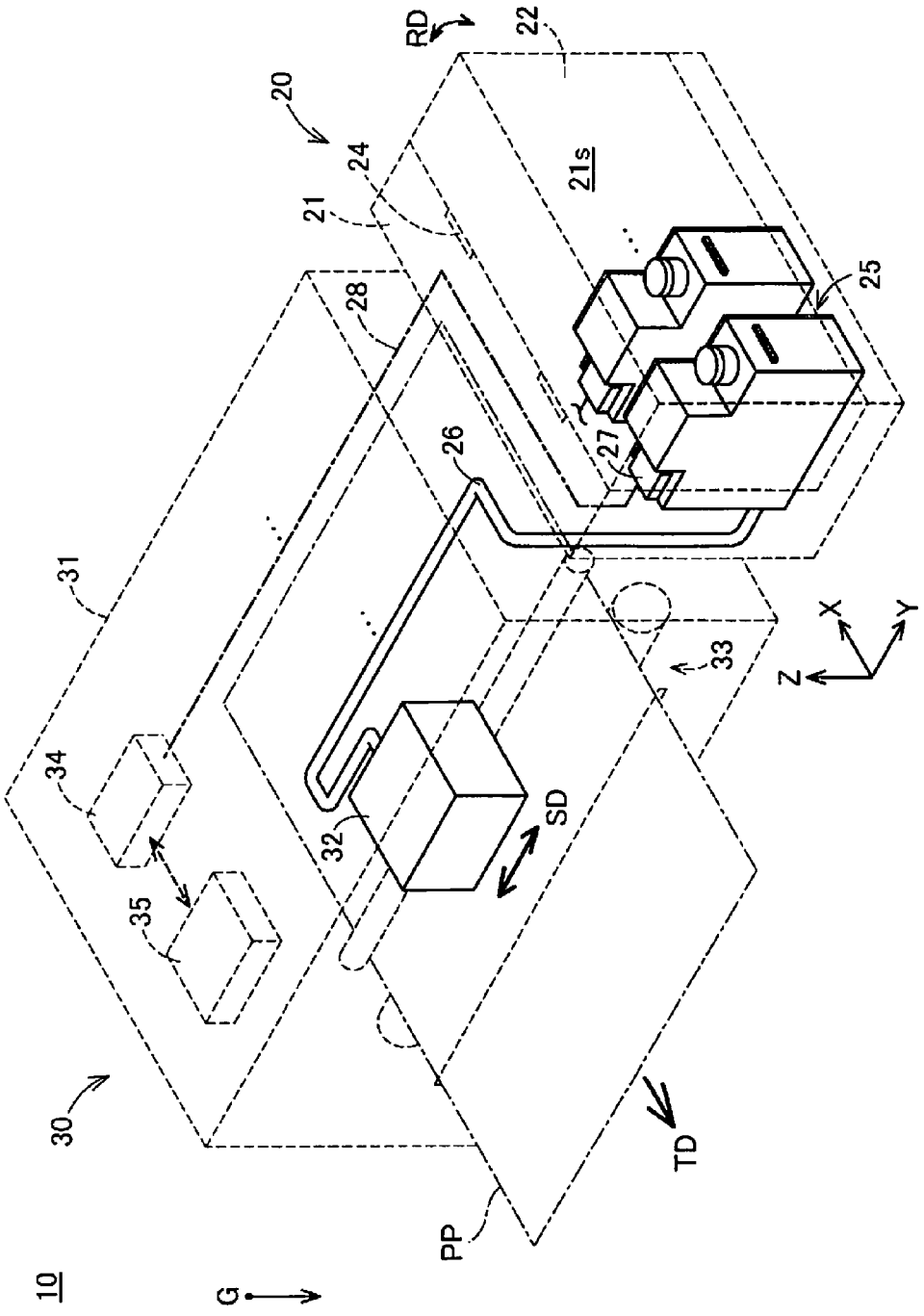


FIG. 1

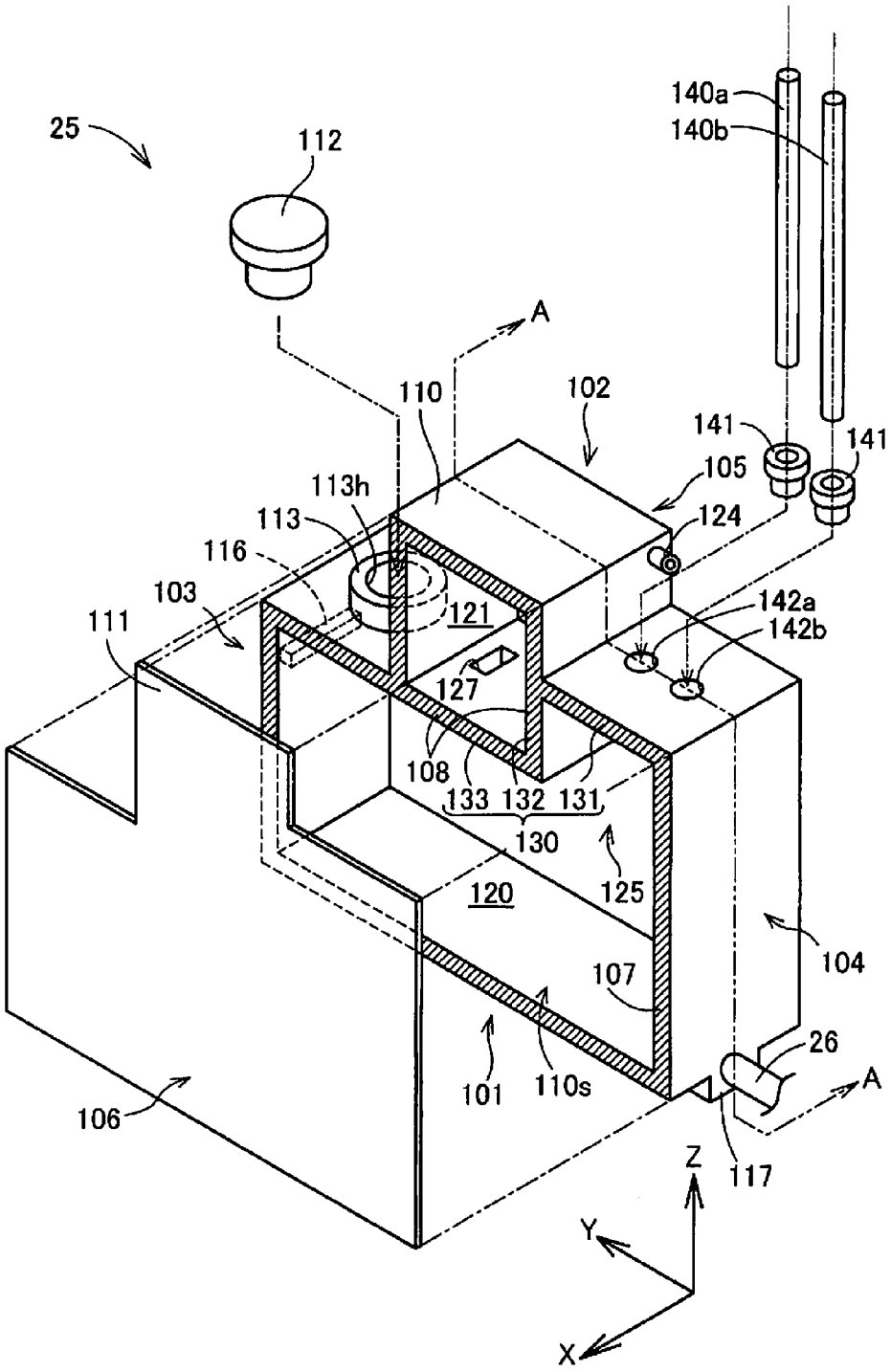

25
112
140a
140b
A
110
102
141
141
105
113h
113
124
116
103
121
142a
142b
111
127
108
133 132 131
130
120
125
104
107
26
A
101
110s
106
117
Z
Y
X

FIG. 2

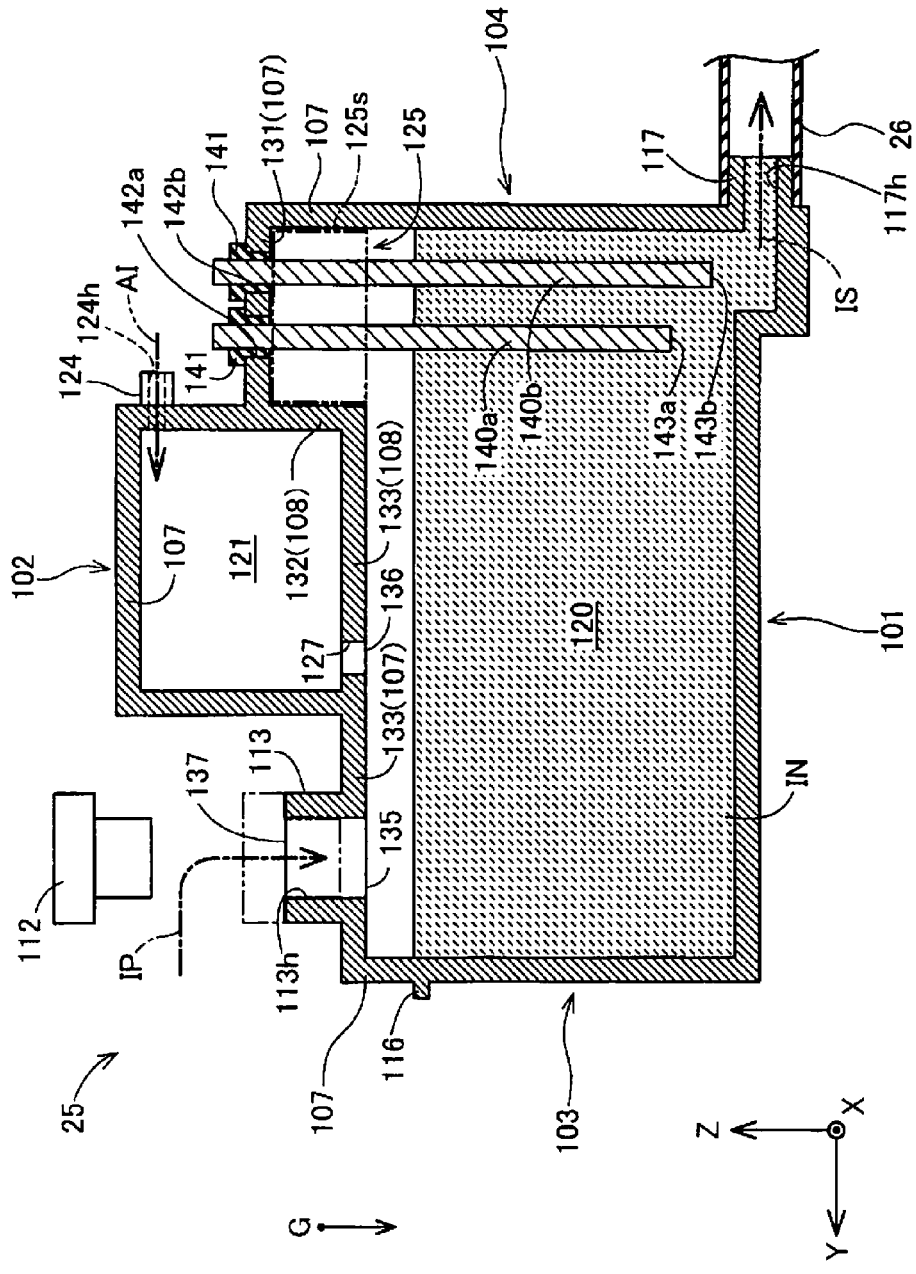

104
131(107)
107
125s
125
141
142a
142b
AI
124h
124
141
117
26
117h
IS
140a
140b
143a
143b
102
107
121
132(108)
133(108)
136
127
133(107)
120
101
113
137
135
IN
112
IP
113h
116
107
103
25
G
Z
X
Y

FIG. 3

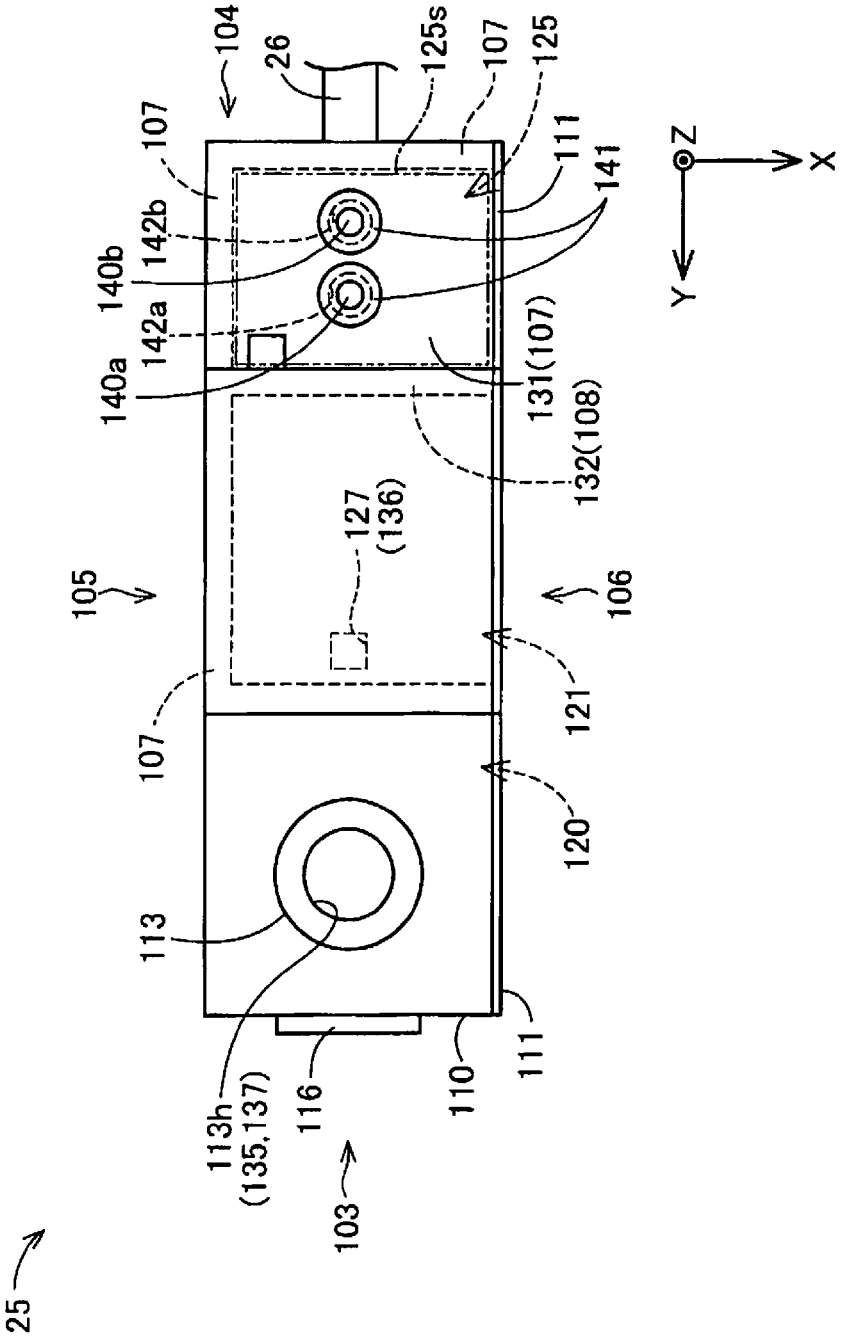

25
103
104
26
125s
107
125
111
141
142b
140b
142a
140a
131(107)
132(108)
127
(136)
105
106
121
120
113
113h
(135,137)
116
110
Z
X
Y

FIG. 4

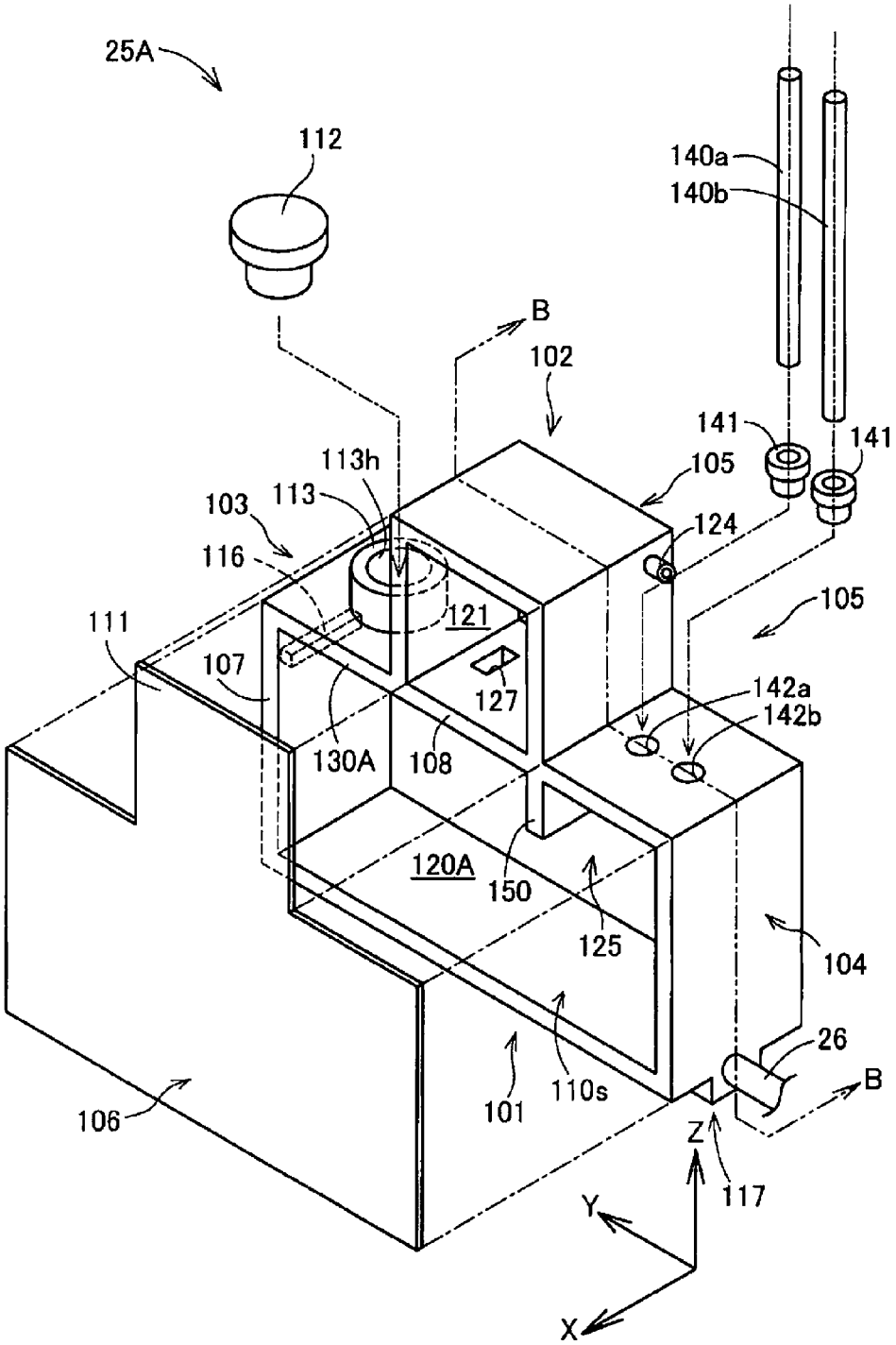

25A
112
140a
140b
B
102
141
141
105
113h
113
103
116
124
105
121
111
107
127
142a
142b
130A
108
120A
150
125
104
26
B
106
101
110s
Z
117
Y
X

FIG. 5

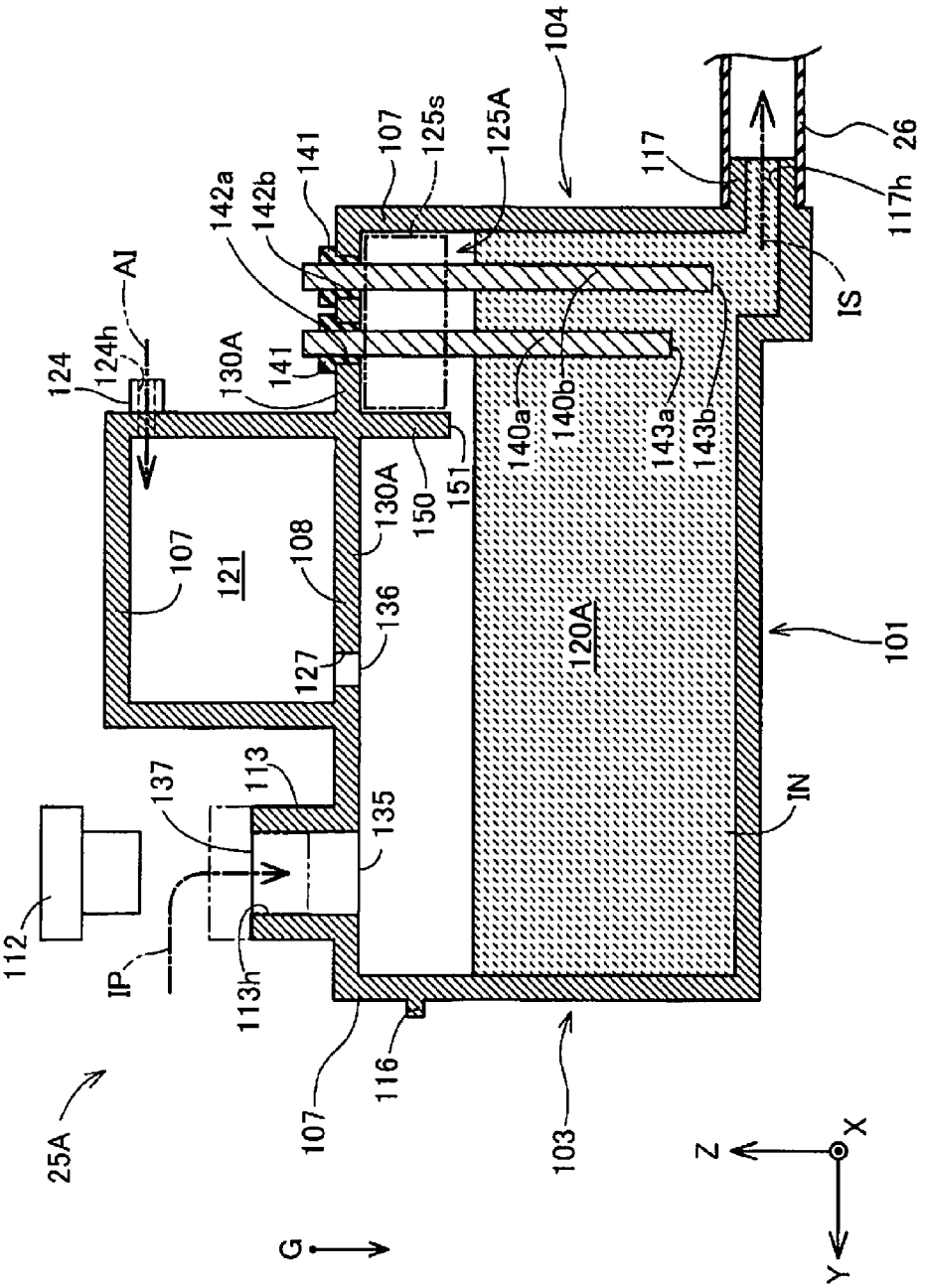

104
107
125s
125A
141
142a
142b
117
26
117h
AI
124
124h
130A
141
IS
140a
140b
143a
143b
150
151
130A
107
121
108
136
127
120A
101
137
113
135
IN
112
IP
113h
116
107
103
25A
G
Z
X
Y

FIG. 6

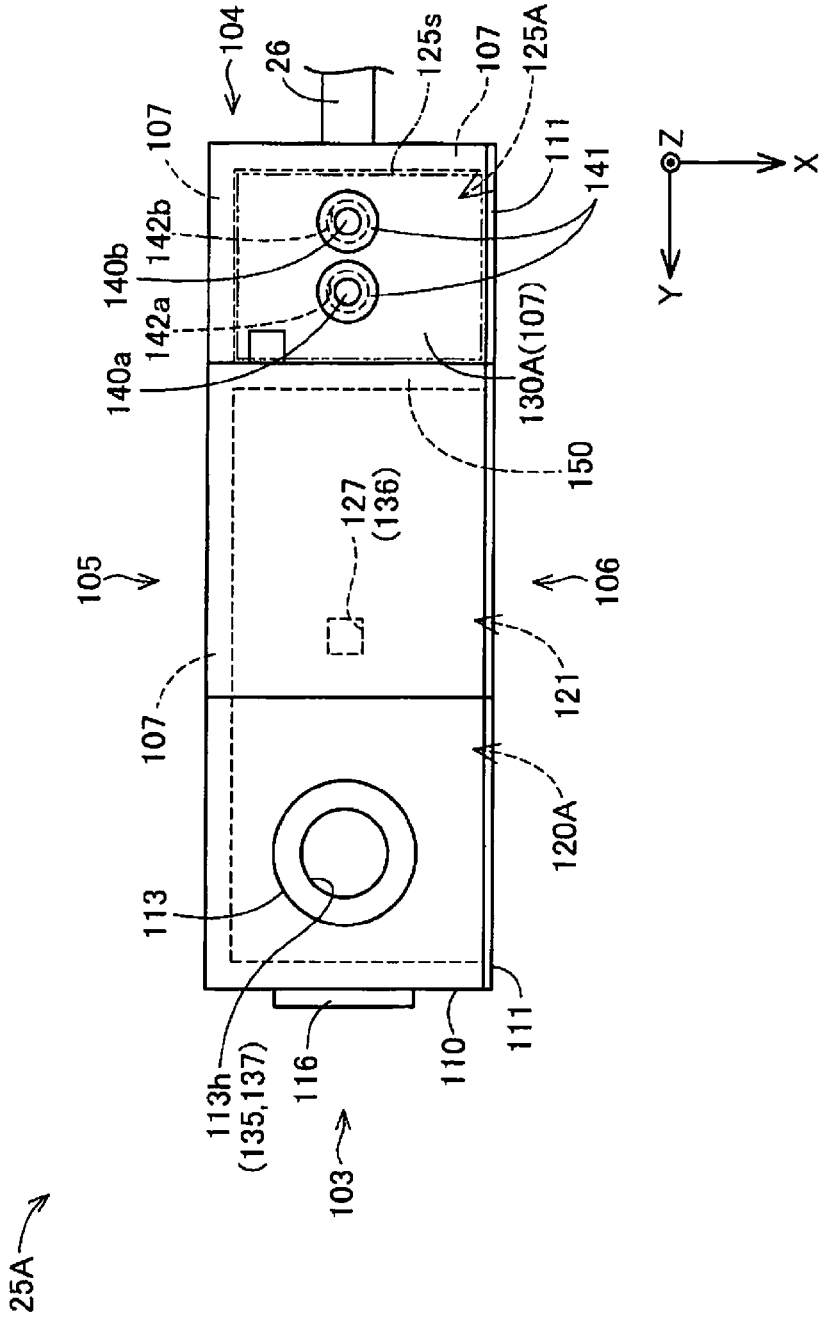

25A
103
113h
(135,137)
116
110
111
113
107
120A
121
106
105
127
(136)
150
130A(107)
140a
142a
140b
142b
107
141
111
125A
107
125s
26
104
Z
X
Y

FIG. 7

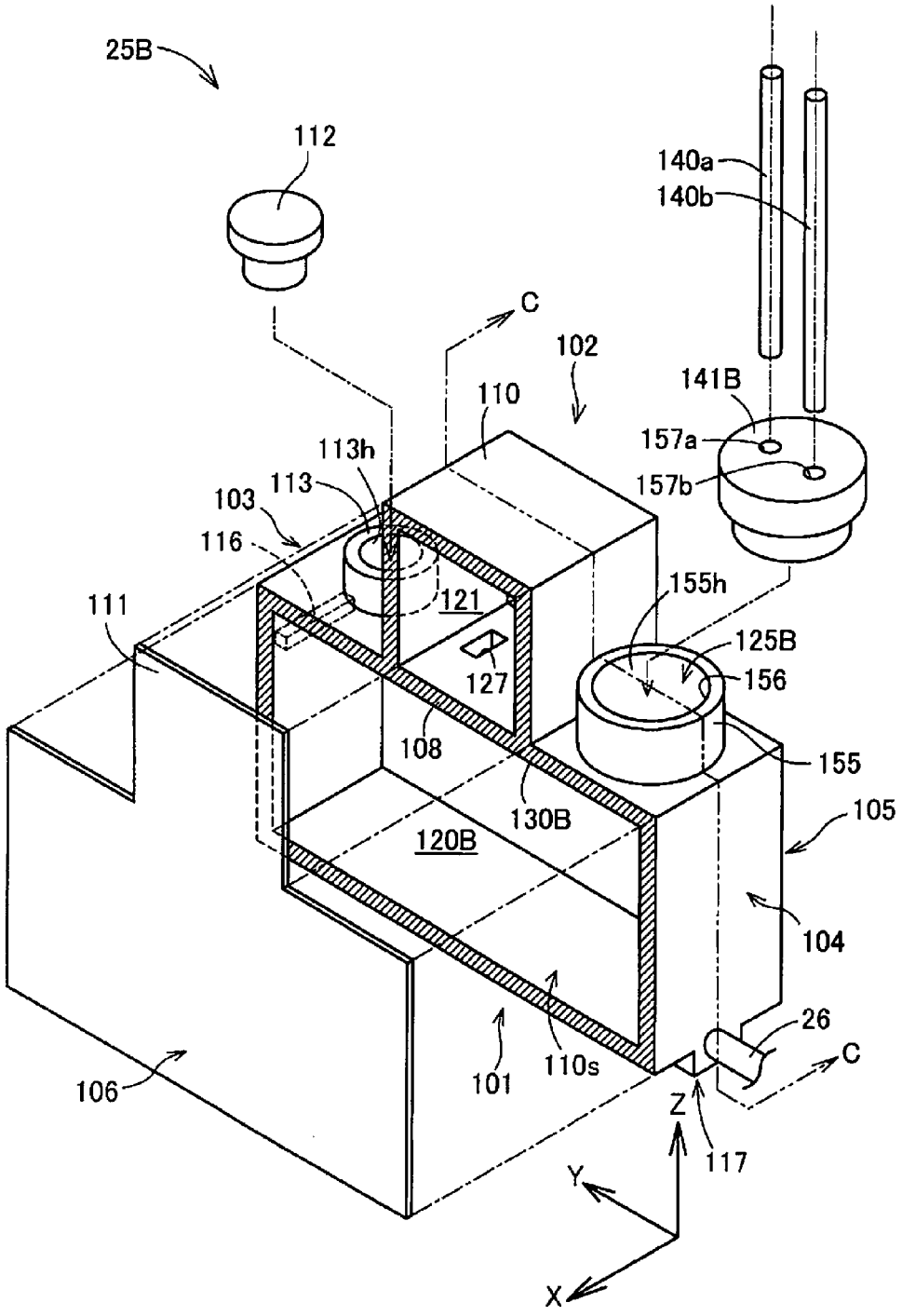

25B
112
140a
140b
C
102
110
141B
157a
157b
113h
113
103
116
111
121
155h
125B
156
127
108
155
130B
105
120B
104
26
C
106
101
110s
Z
117
Y
X

FIG. 8

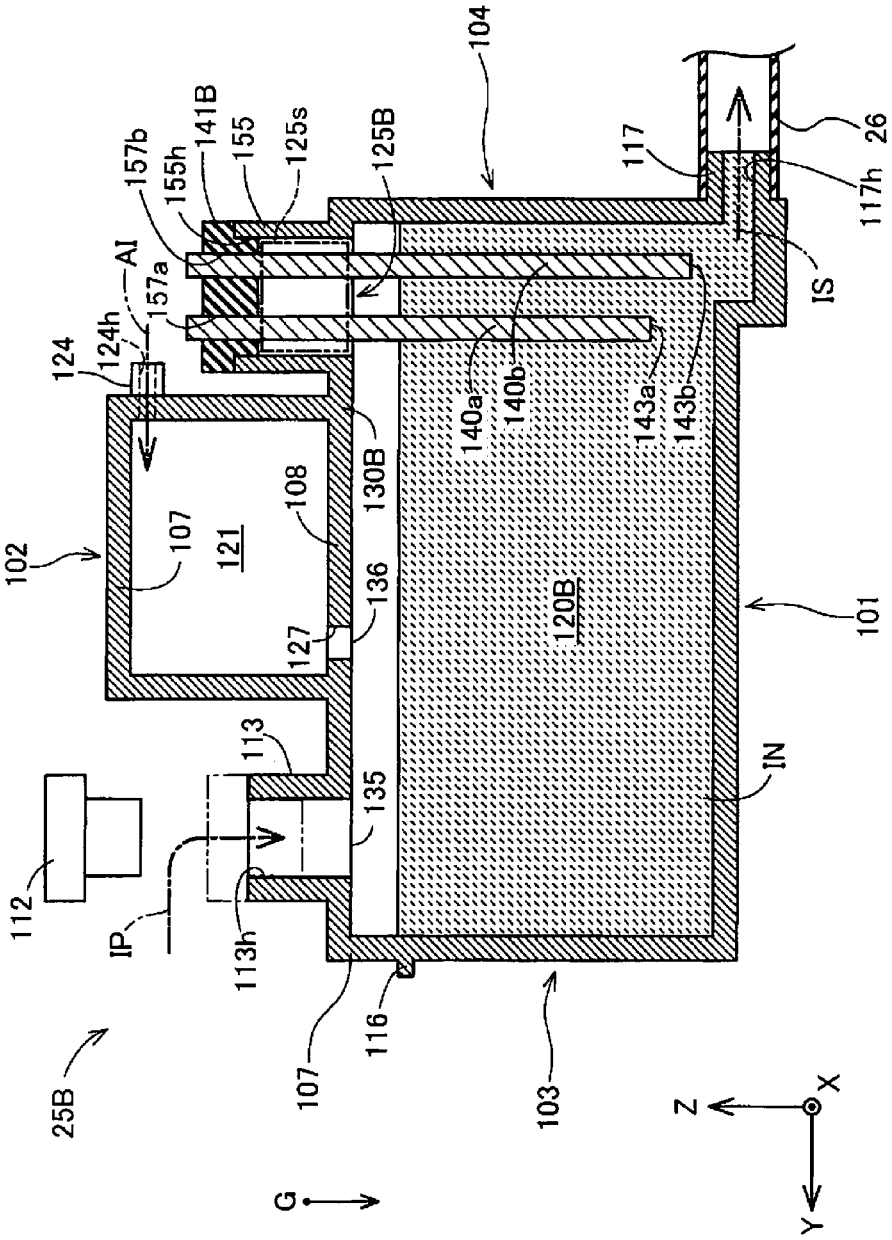

104
141B
155
125s
125B
157b
155h
117
26
117h
AI
157a
IS
124
124h
140a
140b
143a
143b
130B
108
102
107
121
136
101
127
120B
113
IN
135
112
IP
113h
116
107
103
25B
G
Z
X
Y

FIG. 9

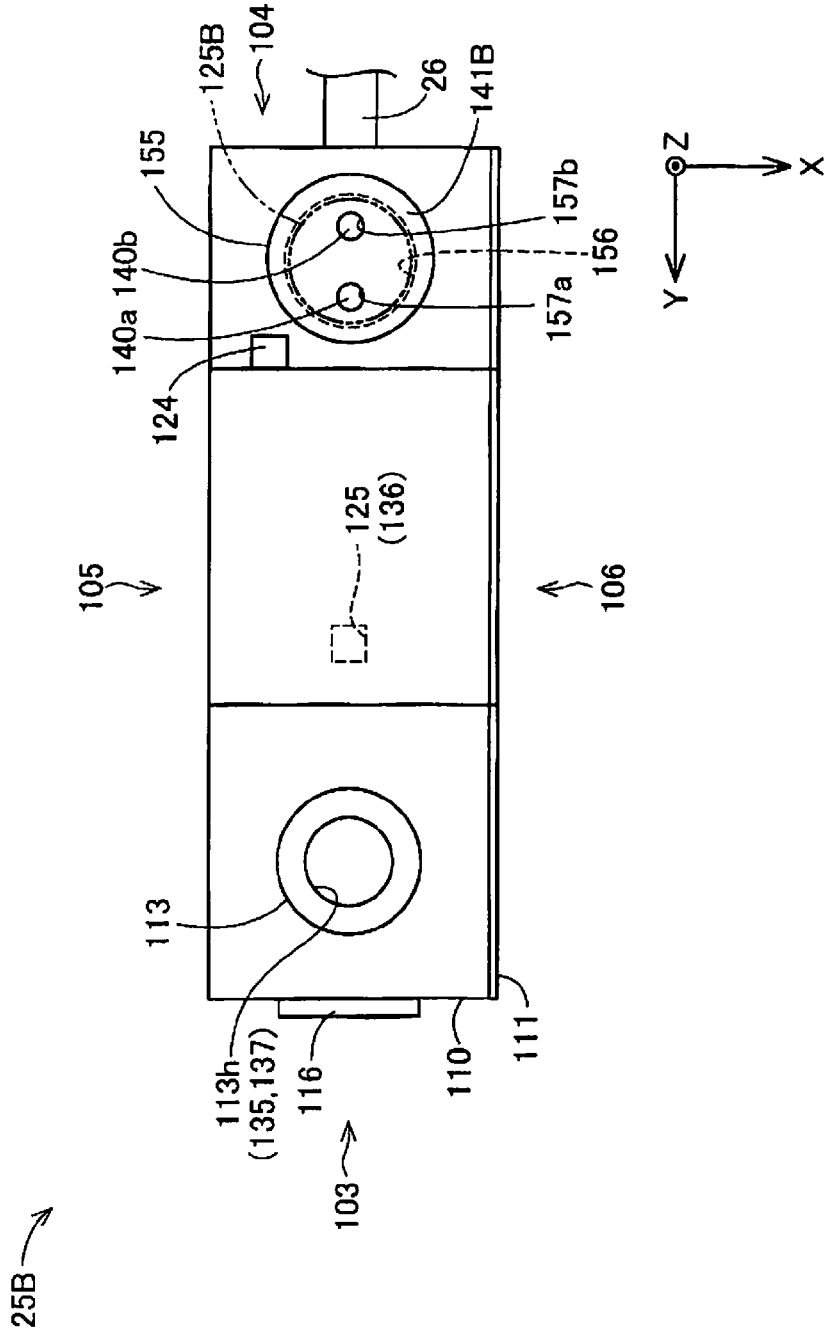

25B
103
113h
(135,137)
116
110
111
113
105
106
125
(136)
124
140a
140b
155
125B
104
26
141B
157b
156
157a
Z
X
Y

FIG.10

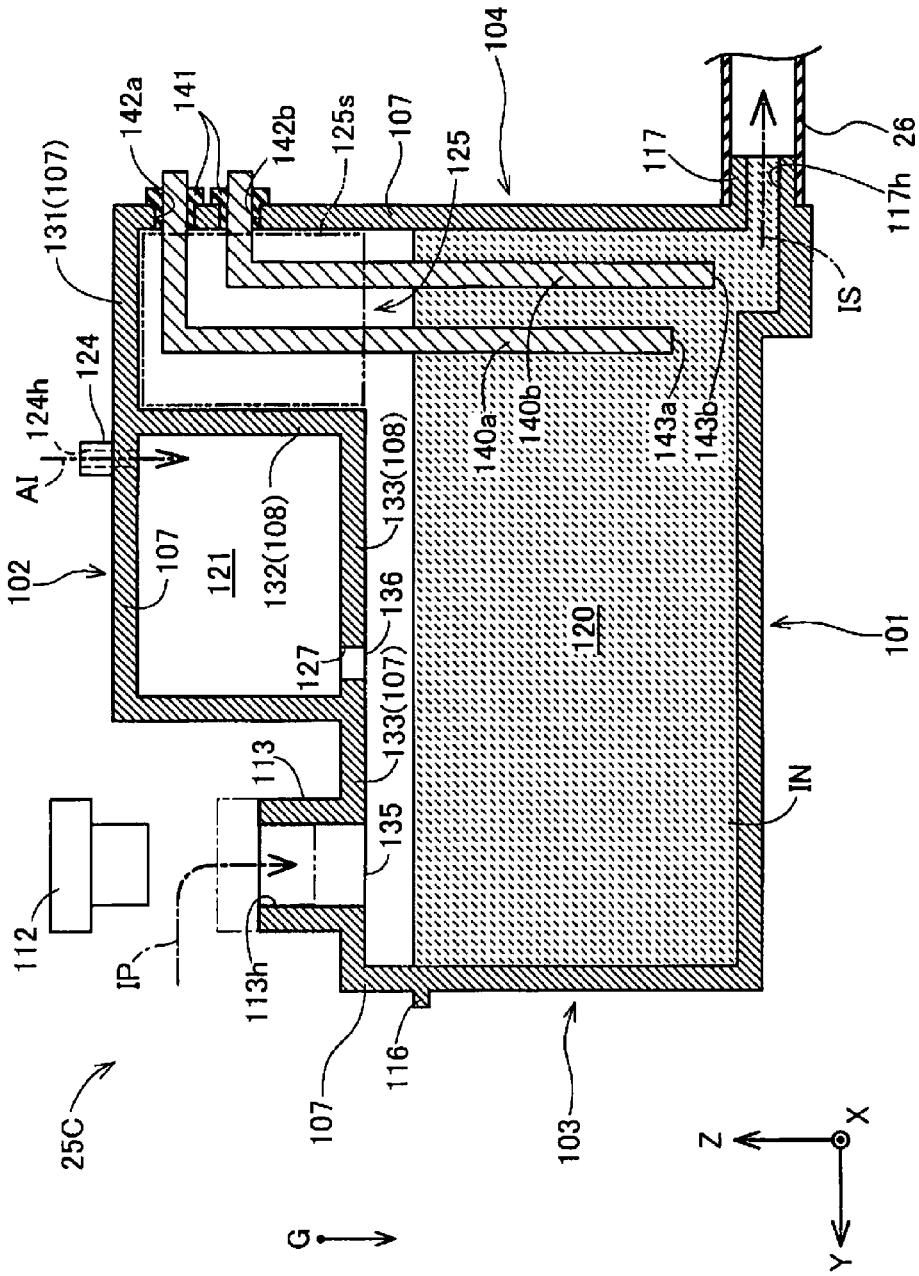

104
142a
141
142b
125s
107
125
117
26
131(107)
117h
IS
124
124h
AI
140a
140b
143a
143b
102
107
121
132(108)
133(108)
136
120
101
127
133(107)
113
135
IN
112
IP
113h
116
107
103
25C
G
Z
X
Y

FIG.11

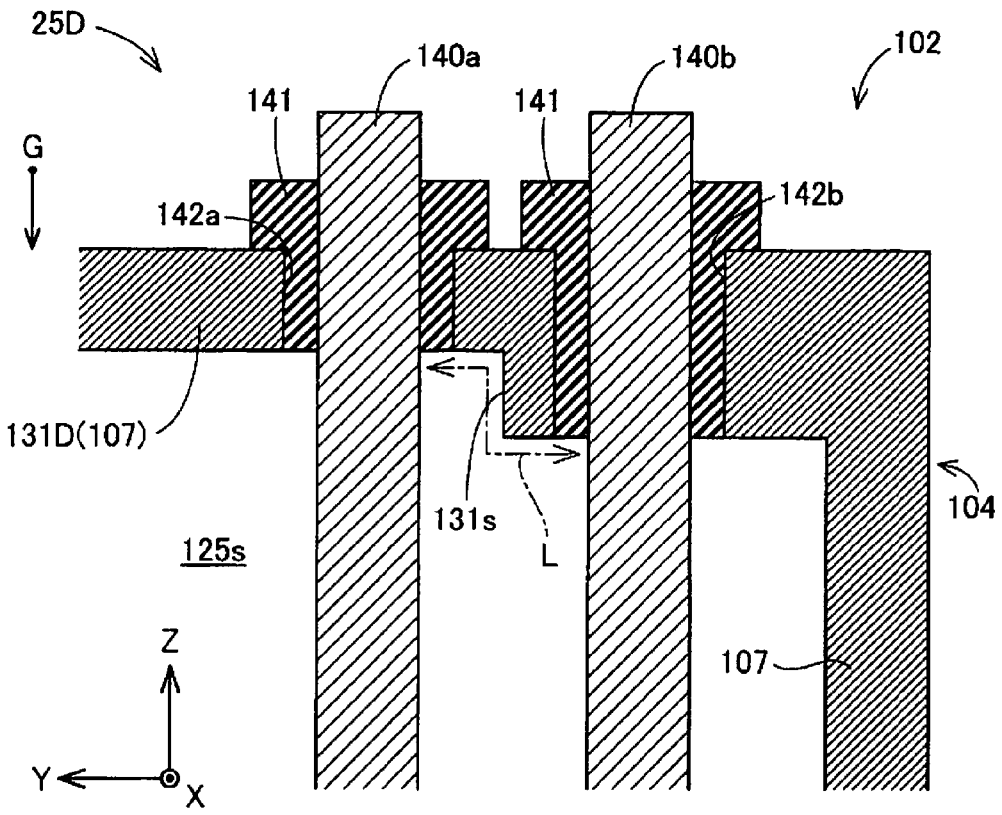

25D
140a
140b
102
141
141
G
142a
142b
131D(107)
131s
L
104
125s
107
Z
Y
X

FIG.12

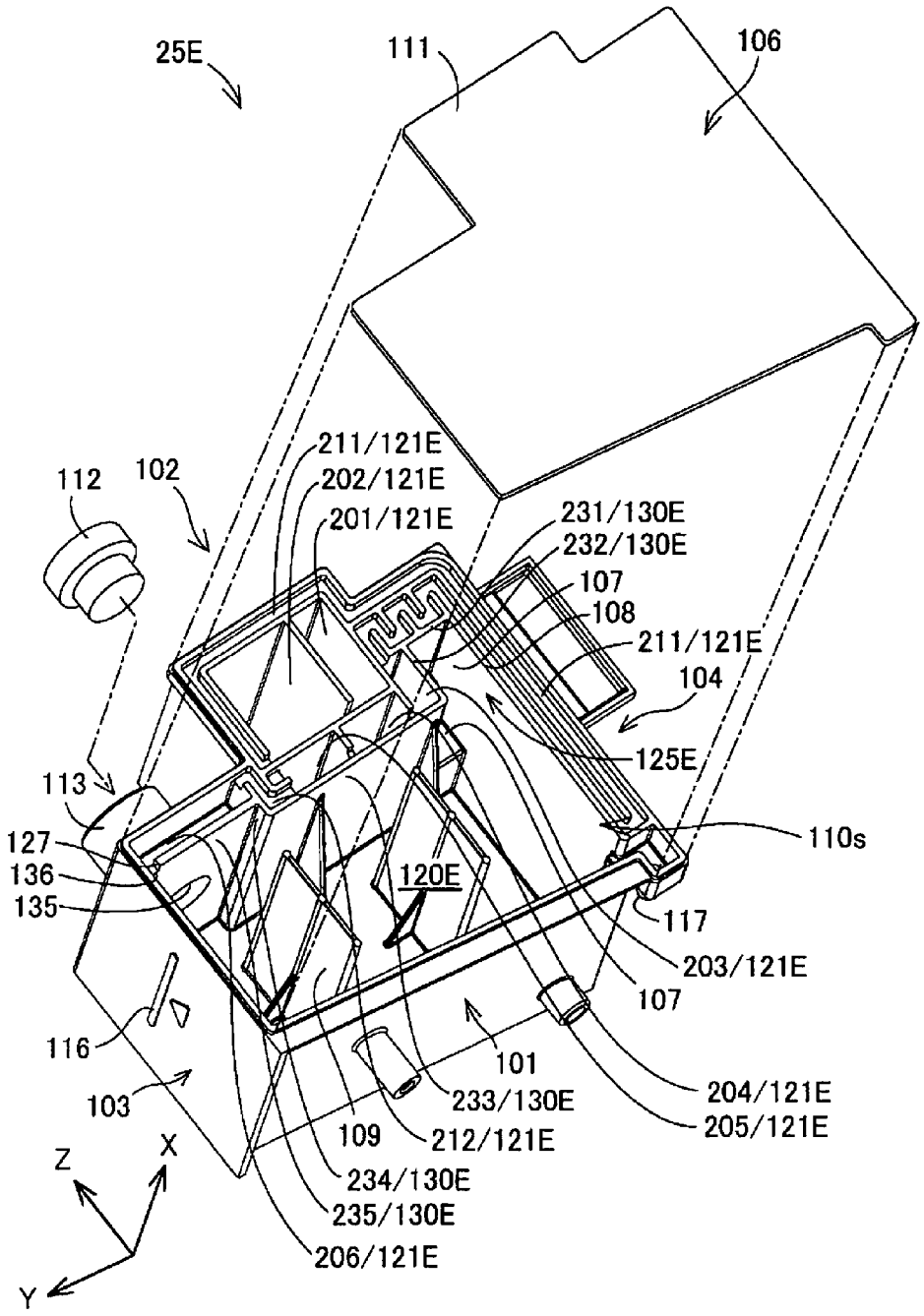

25E
111
106
112
102
211/121E
202/121E
201/121E
231/130E
232/130E
107
108
211/121E
104
125E
113
110s
127
136
135
120E
117
203/121E
107
116
101
103
233/130E
204/121E
205/121E
109
212/121E
234/130E
235/130E
206/121E
Z
X
Y

FIG.13

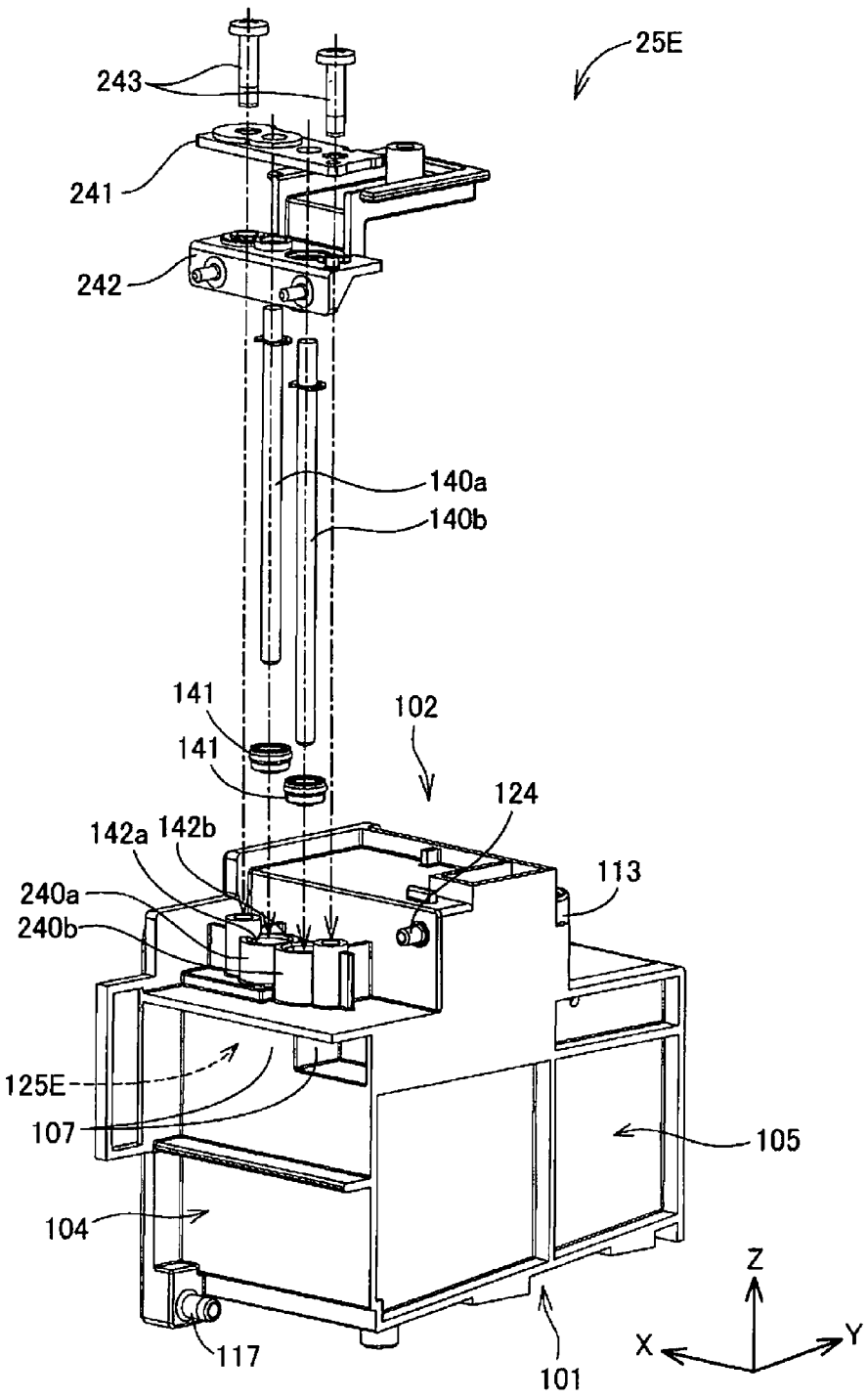

25E
243
241
242
140a
140b
141
141
102
124
142a
142b
240a
240b
113
125E
107
105
104
117
101
Z
X
Y

FIG.14

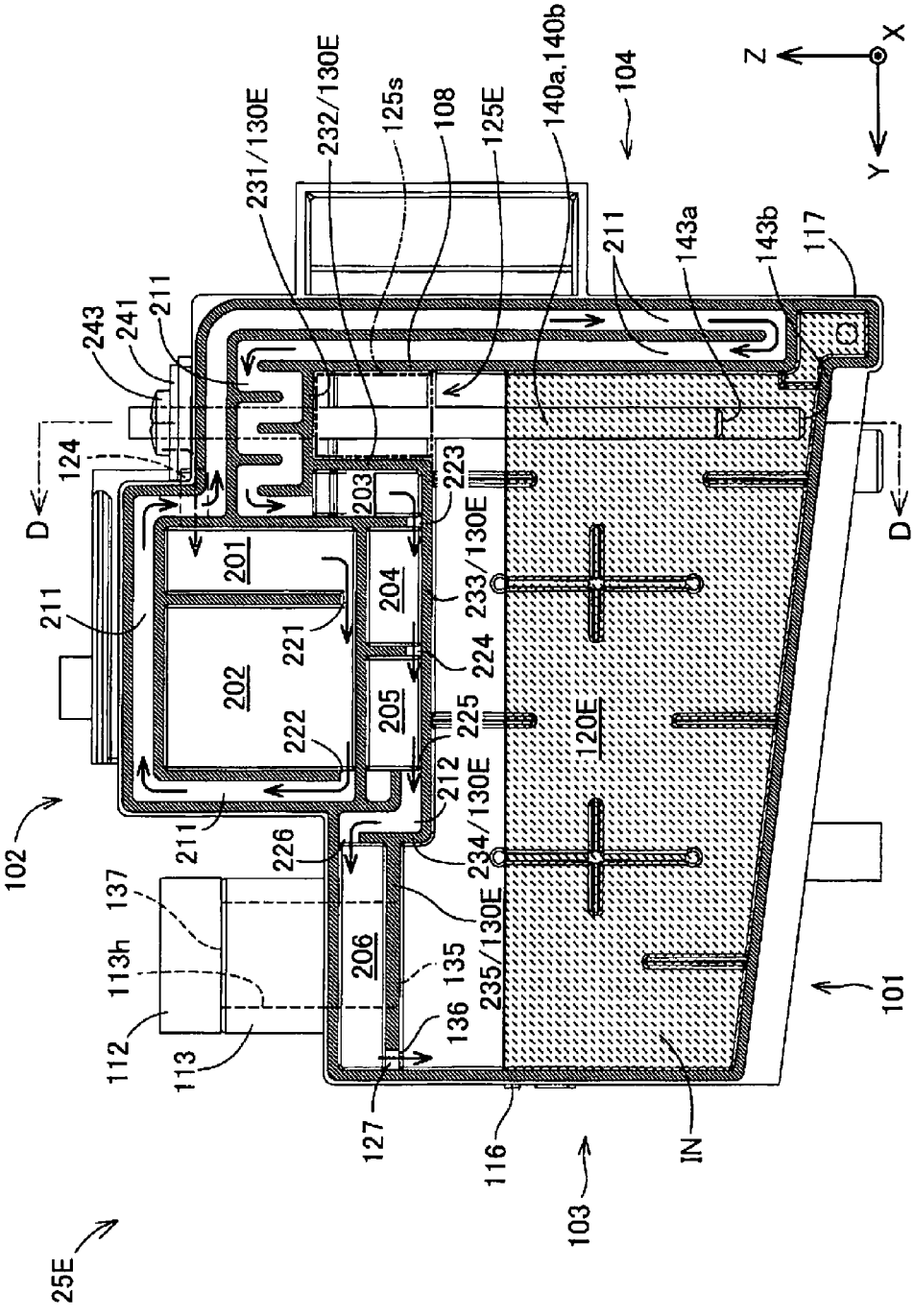

231/130E
232/130E
125s
108
125E
140a,140b
104
Z
X
Y
211
143a
143b
117
243
241
211
124
D
D
203
223
201
204
233/130E
211
221
224
202
205
225
222
120E
212
211
226
234/130E
102
137
113h
206
135
235/130E
136
112
113
127
116
103
IN
101
25E

FIG.15

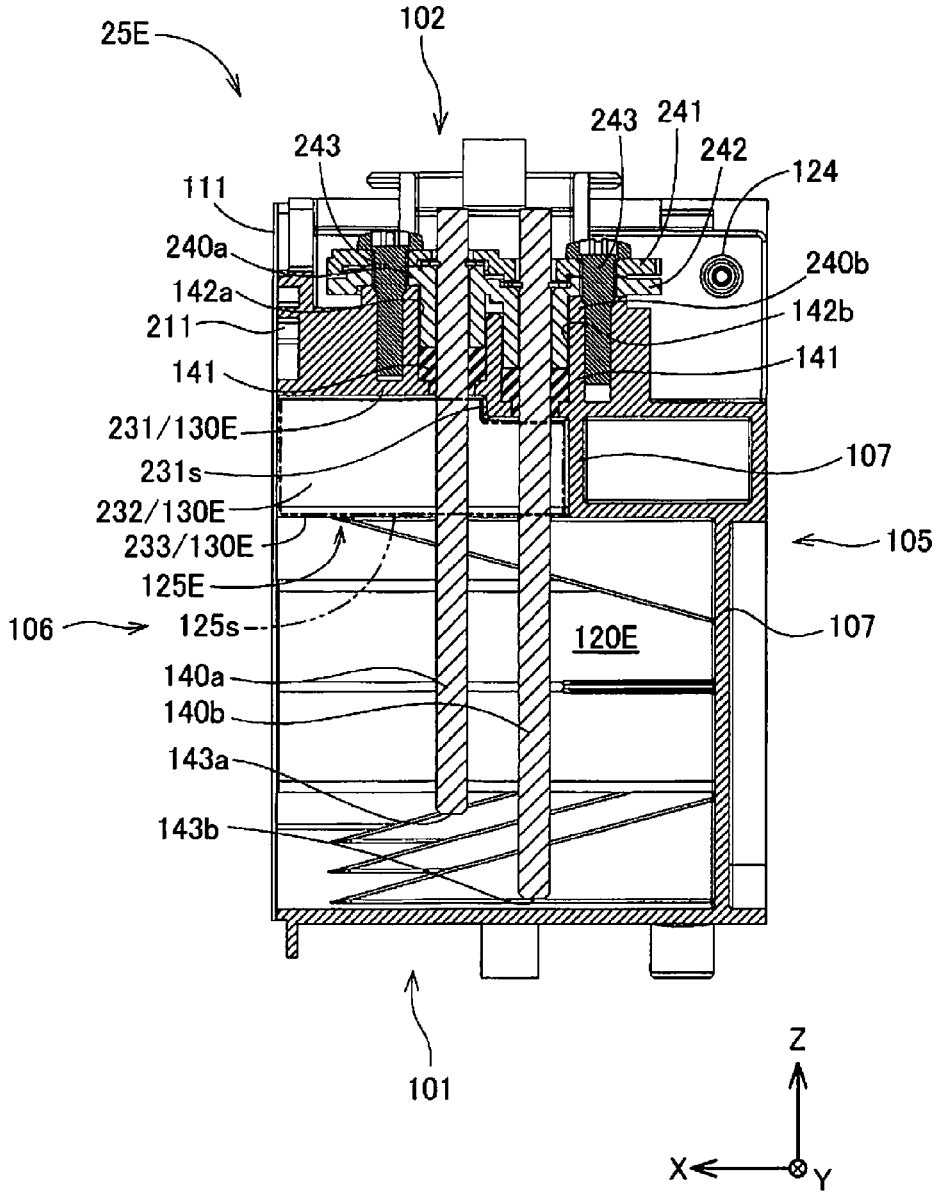

25E
102
243
243
241
242
124
111
240a
240b
142a
142b
211
141
141
231/130E
231s
107
232/130E
233/130E
105
125E
106
125s
120E
107
140a
140b
143a
143b
101
Z
X
Y

FIG.16

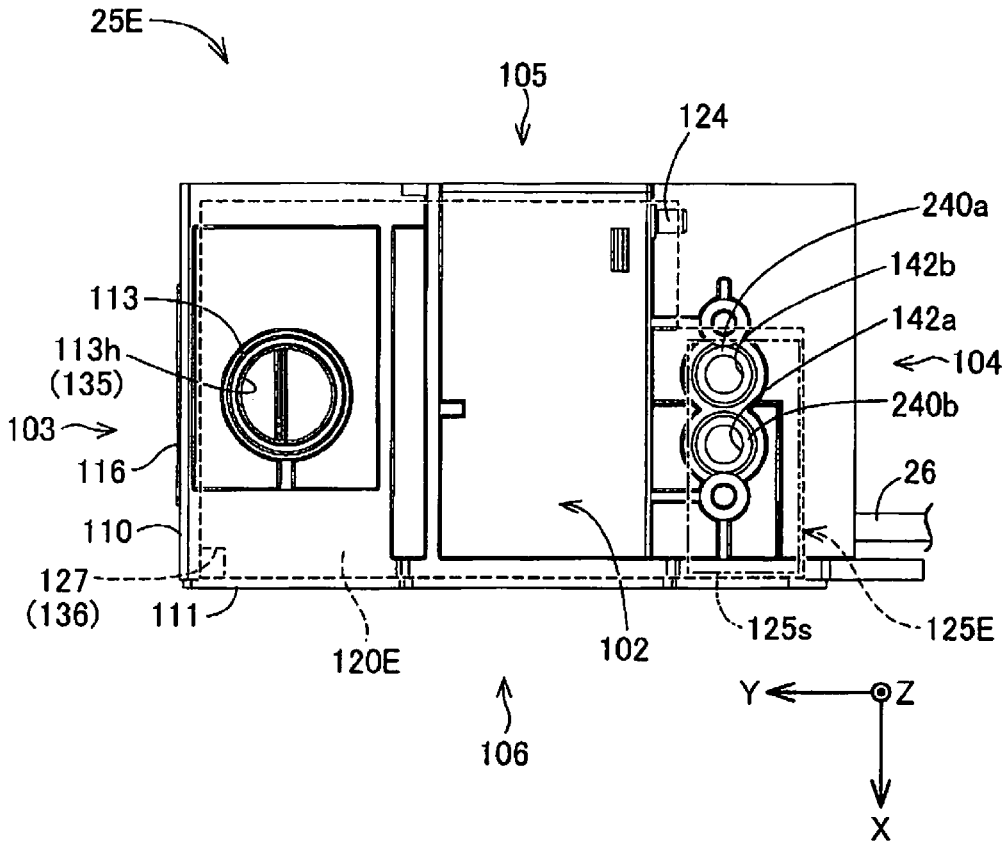

25E
105
124
240a
142b
142a
104
240b
26
113
113h
(135)
103
116
110
127
(136)
111
120E
102
125s
125E
106
Y
Z
X

FIG.17

TANK

BACKGROUND

1. Technical Field

The present invention relates to a tank.

2. Related Art

As one aspect of a tank, an ink tank that can store ink to be supplied to a print head part of an inkjet printer (hereinafter simply referred to as "printer") is known. Some ink tanks are configured such that ink can be replenished by a user in the state where the ink tank is mounted to a printer. With such an ink tank, in some cases, an electrode used for detection of an ink residual amount is attached in an ink container in which ink is stored (for example, JP-A-2014-184594). With the ink tank of JP-A-2014-184594, the ink residual amount in the ink container can be electrically detected with a high accuracy. Therefore, it is possible to prompt a user to replenish ink before ink shortage occurs, and occurrence of malfunction such as a printing failure due to ink shortage is restrained.

As in JP-A-2014-184594, in the case where an electrode used for detection of an ink residual amount is held in an ink container, a through hole for arranging a conductive path for the electrode is formed in a wall part of the ink container in some cases. However, it was found, as study of improvement of an ink tank was successively performed, that if a structure for arranging the conductive path such as the through hole as mentioned above is provided in the wall part of the ink container, there is the possibility that the ink leaks out of the ink tank via the structure depending on the use state of the printer.

SUMMARY

An advantage of some aspects of the invention is to solve the above-described problem regarding not only an ink tank but also at least a tank capable of storing a liquid to be supplied to a liquid jetting head, and the invention can be realized as the following modes.

[1] According to one mode of the invention, a tank is provided. This tank may be capable of supplying a liquid to a liquid jetting head that can jet the liquid, and may include a liquid container, a liquid supply part, a liquid injection part, an atmospheric air introduction part, and an electrode part. The liquid container may be able to store the liquid. The liquid supply part may be able to supply the liquid from the liquid container to the liquid jetting head. The liquid injection part may be able to inject the liquid into the liquid container via a liquid injection port that is open in the liquid container. The electrode part (terminal part) may be stored in the liquid container, and be used for detection of the liquid in the liquid container. The liquid container may have a recess constitution wall part in which a recess is formed in the liquid container, the recess being open downward and having blocked upper and lateral sides when the tank is in a liquid supply posture, that is, when the tank is arranged in a posture when the liquid is supplied to the liquid jetting head when jetting the liquid. The electrode part may be provided in the recess constitution wall part. The liquid injection port and the atmospheric air introduction port may be provided in a section excluding the recess, in the liquid container. According to the tank of this mode, when the tank is in the liquid supply posture, it is possible to retain atmospheric air in the recess and restrain intrusion of the liquid into the recess. Therefore, the liquid is restrained from leaking out of the liquid container via a structure for providing the electrode part that is provided in the recess.

[2] In the tank of the above mode, a posture of the tank when the liquid is injected into the liquid container via the liquid injection port may be the same as the liquid supply posture. According to the tank of this mode, also in the case where a liquid is replenished, atmospheric air is retained in the recess, and thus the liquid surface of the liquid is restrained from reaching a through hole in the recess.

[3] In the tank of the above mode, a through hole, which communicates with the outside of the liquid container and in which at least a portion of the electrode part is arranged, may be provided in the recess constitution wall part, and a sealing member for holding the electrode part may be arranged between an inner peripheral surface of the through hole and the electrode part. According to the tank of this mode, airtightness of the liquid container is improved by the sealing member. In addition, because a liquid is restrained from reaching the recess, adhesion of ink to the sealing member is restrained, and deterioration of the sealing member is restrained. Therefore, leakage of the ink due to the deterioration of the sealing member is restrained.

[4] In the tank of the above mode, the liquid container may have an upper wall part that is positioned above the liquid container and extends in a direction intersecting the gravity direction when the tank is in the liquid supply posture, and the upper wall part may include at least: a first upper wall part that, when the tank is in the liquid supply posture, extends in a direction intersecting the gravity direction and is positioned, as a portion of the recess constitution wall part, above a space in the recess; a sidewall part that extends downward from the first upper wall part and is positioned, as a portion of the recess constitution wall part, lateral to the space in the recess when the tank is in the liquid supply posture; and a second upper wall part that is at a position lower than the first upper wall part and extends from the sidewall part in a direction that intersects the gravity direction and is a direction of separating from the recess when the tank is in the liquid supply posture. According to the tank of this mode, the recess is arranged at a position above the liquid container when the tank is in the liquid supply posture, and thus ink is restrained from reaching the through hole in the recess. In addition, also due to the second upper wall part that is at a position lower than the first upper wall part in the recess, ink is restrained from reaching the through hole in the recess.

[5] In the tank of the above mode, the upper wall part may further include: a third upper wall part that is positioned at a position higher than the second upper wall part and extends in a direction intersecting the gravity direction when the tank is in the liquid supply posture, the third upper wall part may be on an opposite side to the first upper wall part and sandwich the sidewall part and the second upper wall part with the first upper wall part, and the liquid injection port and the atmospheric air introduction port may be formed so as to be open toward a region positioned below the third upper wall part when the tank is in the liquid supply posture. According to the tank of this mode, the liquid injection port and the atmospheric air introduction port sandwich the sidewall part and the second upper wall part and are formed at positions spaced apart from the recess, and therefore atmospheric air retentivity in the recess is further improved, and intrusion of the ink into the recess is further restrained.

[6] In the tank of the above mode, the liquid container may include: an upper wall part that is positioned above the liquid container and extends in a direction intersecting the gravity direction when the tank is in the liquid supply

posture; a bottom wall part that is positioned below the liquid container, faces the upper wall part, and extends in a direction intersecting the gravity direction when the tank is in the liquid supply posture; and a partition wall part that extends from the upper wall part to a position between the upper wall part and the bottom wall part so as to partition a space in the liquid container, and the partition wall part may be positioned, as a portion of the recess constitution wall part, lateral to a space in the recess. According to the tank of this mode, the recess can be easily formed in the liquid container using the partition wall part.

[7] In the tank of the above mode, the tank may further include: a case member, which is a box body that is open in one direction; and a sheet member that is joined to the case member so as to be capable of sealing the opening of the case member, wherein the liquid container may be positioned between the case member and the sheet member, and an inner wall surface of the recess may be constituted by the inner wall surface of the case member and the surface of the sheet member. According to the tank of this mode, simplification, miniaturization and weight reduction of the configuration is possible.

[8] In the tank of the above mode, a sidewall of the recess, which is a portion of the recess constitution wall part, may be constituted by a wall part of a cylindrical part protruding outward of the liquid container. According to the tank of this mode, the recess is formed at a section protruding from the liquid container, and thus intrusion of a liquid into the recess is further restrained.

[9] In the tank of the above mode, the electrode part may be provided in an upper end wall part positioned on the upper side in the recess when the tank is in the liquid supply posture. According to the tank of this mode, a liquid is further restrained from reaching a section having the structure for arranging the electrode part.

[10] In the tank of the above mode, the electrode part may be provided in a sidewall of the recess. According to the tank of this mode, the electrode part can be arranged in a wall part positioned in a direction intersecting the gravity direction when the tank is in the liquid supply posture.

[11] In the tank of the above mode, the electrode part may be provided at a position higher than the liquid injection port in the recess when the tank is in the liquid supply posture. According to the tank of this mode, a liquid from the liquid injection port is restrained from reaching a section in which the electrode part is provided.

[12] In the tank of the above mode, the liquid injection part may include a liquid intake port that is open outward of the tank, and the electrode part may be provided at a position higher than the liquid intake port in the recess constitution wall part when the tank is in the liquid supply posture. According to the tank of this mode, outside the tank, a liquid from the liquid intake port is restrained from reaching the section having the structure for providing the electrode part. Therefore, the liquid is restrained from coming into contact with an unexpected section of the electrode part, and deterioration of the electrode part, decline in detection accuracy of the liquid and the like are restrained.

[13] Furthermore, the tank of the above mode may further include: a first sidewall part and a second sidewall part that face each other and sandwich the liquid container in a direction intersecting the gravity direction when the tank is in the liquid supply posture, wherein the liquid injection port may be positioned between the first sidewall part side and a center between the first sidewall part and the second sidewall part in a direction from the first sidewall part to the second sidewall part, and the electrode may be provided in the recess constitution wall part between the second sidewall part side and the center between the first sidewall part and the second sidewall part. According to the tank of this mode, the liquid injection port and the section of the recess constitution wall part in which the electrode part is provided are arranged at positions that are spaced apart from each other, and thus a liquid from the liquid injection port is restrained from reaching the section.

[14] In the tank of the above mode, at least a portion of the atmospheric air introduction part may be positioned, in the direction from the first sidewall part toward the second sidewall part, between the liquid injection part and the section in the recess constitution wall part in which the electrode part is provided, and may protrude above the liquid injection part and the section in the recess constitution wall part in which the electrode part is provided when the tank is in the liquid supply posture. According to the tank of this mode, due to the atmospheric air introduction part that protrudes upward, a liquid from the liquid injection is restrained from reaching the section in which the electrode part is provided, outside the tank.

Not all of the constituent components provided in the above-described modes of the invention are essential, and some of the constituent components may be modified, deleted, or replaced with a new constituent component, or the content of limitation may be partially deleted as appropriate, in order to solve a part of or the entire problem described above, or to achieve some or all of the effects described in this specification. It is also possible to combine some or all of the technical features included in one of the above-described modes of the invention with some or all of the technical features included in another one of the above-described modes of the invention to make an independent mode of the invention, in order to solve a part of or the entire problem described above, or to achieve some or all of the effects described in the specification.

The invention can also be achieved in various modes other than a tank that can supply a liquid to a liquid jetting head. For example, the invention can be achieved as a tank unit provided with a tank, or a liquid jetting system. In addition, the invention can also be achieved as a tank that can supply a liquid to an apparatus other than the liquid jetting head, or a tank unit or a system provided with the tank. Note that in this specification, "system" refers to a group of constituent elements that are compositely combined in an integral or distributed state, such that the functions of the constituent elements are related to one another directly or indirectly, in order to achieve one or more functions. Therefore, the system in this specification also includes an "apparatus" in which a plurality of constituent elements are integrally combined.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described with reference to the accompanying drawings, wherein like numbers reference like elements.

FIG. **1** is a schematic diagram showing a configuration of an inkjet printer.

FIG. **2** is a schematic exploded perspective diagram of an ink tank.

FIG. **3** is a schematic cross-sectional diagram of an ink tank.

FIG. **4** is a schematic top view diagram of an ink tank.

FIG. **5** is a schematic exploded perspective diagram of an ink tank of a second embodiment.

FIG. **6** is a schematic cross-sectional diagram of the ink tank of the second embodiment.

FIG. **7** is a schematic top view diagram of the ink tank of the second embodiment.

FIG. **8** is a schematic exploded perspective diagram of an ink tank of a third embodiment.

FIG. **9** is a schematic cross-sectional diagram of the ink tank of the third embodiment.

FIG. **10** is a schematic top view diagram of the ink tank of the third embodiment.

FIG. **11** is a schematic cross-sectional diagram of an ink tank of a fourth embodiment.

FIG. **12** is a schematic cross-sectional diagram for describing a configuration of an ink tank as a fifth embodiment.

FIG. **13** is a schematic exploded perspective diagram of an ink tank of a sixth embodiment.

FIG. **14** is a schematic exploded perspective diagram of the ink tank of the sixth embodiment.

FIG. **15** is a schematic cross-sectional diagram of the ink tank of the sixth embodiment.

FIG. **16** is a schematic cross-sectional diagram of the ink tank of the sixth embodiment.

FIG. **17** is a schematic top view diagram of the ink tank of the sixth embodiment.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

A. First Embodiment

Configuration of Printer

FIG. **1** is a schematic diagram showing the configuration of an inkjet printer **10** (hereinafter simply referred to as "printer **10**") that is provided with ink tanks **25** as the first embodiment of the invention. In FIG. **1**, an arrow G indicating the gravity direction when the printer **10** is in a normal use state is illustrated. In this specification, "upper/upward/above" and "lower/downward/below" mean the up-down direction based on the gravity direction unless especially stated otherwise. In addition, in FIG. **1**, arrows X, Y and Z indicating three directions that are based on the ink tank **25** and orthogonally intersect one another are illustrated. The directions indicated by the arrows X, Y and Z will be described later. Arrows G, X, Y and Z are also appropriately illustrated in the drawings referred to in the following description.

The printer **10** is one aspect of the liquid jetting system, and forms an image on a printing side of printing paper PP by discharging ink droplets onto the printing paper PP, which is a printing medium. The printer **10** is provided with a tank unit **20** and a printing part **30**. The tank unit **20** is provided with a casing part **21**, a plurality of the ink tanks **25**, a plurality of tubes **26**, a plurality of circuit units **27**, and a plurality of signal lines **28** (indicated by dashed-dotted lines).

The ink tank **25** corresponds to a subordinate concept of the tank in the invention. Ink of a different color is stored in each of the ink tanks **25**. The ink stored in the ink tanks **25** is supplied to a printing head part **32** of the printing part **30** via the tubes **26** that are made of resin having flexibility and are connected to the ink tanks **25** one by one.

Electrode pins (not illustrated) used for detecting the stored ink are attached to the ink tanks **25**, and the electrode pins are electrically connected to the circuit units **27**. The circuit units **27** are electrically connected to an ink detection part **34** of the printing part **30** via the signal lines **28**, and mediate the electric connection between the electrode pins and the ink detection part **34**. The configuration of the ink tank **25**, and the electrode pins will be described later.

In the tank unit **20**, the ink tanks **25** are fixed to an internal space **21***s* of the casing part **21** in the state where the ink tanks **25** are aligned in a line in a width direction indicated by the arrow X (to be described later). The casing part **21** is provided with a lid part **22**. The lid part **22** is coupled to a main body of the casing part **21** using a hinge mechanism **24**, and is open and closes by rotating in a direction indicated by an arrow RD. By the user of the printer **10** opening the lid part **22**, various operations for the ink tanks **25** become possible. Note that the casing part **21** does not need to be constituted to be capable of opening and closing by rotation of the lid part **22**, and may be constituted to be capable of opening and closing by attaching or detaching of the lid part **22**, for example. In addition, the lid part **22** may be equipped with a window part that enables visual recognition of the ink tanks **25** from outside without opening or closing the lid part **22**, a window part that allows the ink tanks **25** to be replenished with ink, or the like.

The printing part **30** corresponds to a subordinate concept of a liquid jetting apparatus, and is provided with a casing part **31**, the printing head part **32**, a conveyance mechanism **33** for the printing paper PP, the ink detection part **34**, and a control unit **35**. The casing part **31** is an exterior part of the printing part **30**, and has the control unit **35**, the printing head part **32**, and the conveyance mechanism **33** stored therein.

The printing head part **32** is installed so as to be reciprocably movable in a main scanning direction SD on a conveyance path for the printing paper PP. The printing head part **32** is connected to the ink tanks **25** of the tank unit **20** via the above plurality of tubes **26**. The printing head part **32** can jet ink supplied from the ink tanks **25** under the control by the control unit **35**. The printing head part **32** corresponds to a subordinate concept of the liquid jetting head of the invention. The conveyance mechanism **33** can convey the printing paper PP in a conveyance direction TD intersecting the main scanning direction SD by rotationally driving a conveyance roller.

As described above, the ink detection part **34** is electrically connected to the electrode pins of the ink tanks **25** via the signal lines **28** and the circuit units **27**. The ink detection part **34** periodically applies a current for detecting ink in the ink tanks **25** to the electrode pins of the ink tanks **25** via the signal lines **28**, and detects change in resistance. The ink detection part **34** transmits a detection result to the control unit **35**.

For example, the control unit **35** is constituted by a microcomputer provided with a central processing apparatus and a main storage apparatus. The control unit **35** executes various functions by the central processing apparatus loading various programs to the main storage apparatus and executing the programs. In this embodiment, the control unit **35** functions as a printing processing part for controlling the printing part **30** based on printing data input from outside and executing printing processing. In the printing processing, the conveyance mechanism **33** conveys the printing paper PP, and the printing head part **32** discharges ink droplets while reciprocally moving in the main scanning direction SD, whereby a print image is formed on the printing side of the printing paper PP.

In addition, in this embodiment, the control unit **35** also functions as an ink residual amount management unit for detecting whether or not ink of a predetermined amount or more is stored in each of the ink tanks **25** based on the change in resistance detected by the ink detection part **34**. In

the case where it is detected that the ink residual amount in the ink tanks **25** became lower than the predetermined amount, the control unit **35** executes informing processing of informing the user that a replenishment time has come, for example. In addition, the control unit **35** may start measuring the remaining number of times that ink droplets can be discharged by the printing head part **32**.

In this embodiment, the casing part **21** of the tank unit **20** and the casing part **31** of the printing part **30** are coupled in a detachable and rotatable state (not illustrated). In this manner, the tank unit **20** and the printing part **30** are constituted as separate bodies, and thereby maintenance can be independently performed on the tank unit **20** and the printing part **30**, and maintainability of the printer **10** is enhanced. In addition, due to the tank unit **20** and the printing part **30** being coupled, moving and installing the printer **10** becomes easy. However, the tank unit **20** and the printing part **30** do not need to be coupled.

Configuration of Ink Tank

The configuration of the ink tank **25** will be described with reference to FIGS. **2** to **4** in addition to FIG. **1**. FIG. **2** is a schematic exploded perspective diagram of the ink tank **25**. FIG. **3** is a schematic cross-sectional diagram of the ink tank **25** in a cross section taken along A-A shown in FIG. **2**. In FIG. **3**, a state in which ink IN is stored in an ink container **120**, and a cap member **112** has been removed from an ink injecting part **113** is schematically illustrated. FIG. **4** is a schematic top view diagram of the ink tank **25** when viewed in a direction from a second face part **102** to a first face part **101**. In FIG. **4**, portions of an internal structure are illustrated by broken lines.

The ink tank **25** is constituted as a hollow container having six face parts **101** to **106** (FIG. **2**). The six face parts **101** to **106** will be described based on a posture when the ink tank **25** is mounted to the tank unit **20** (FIG. **1**). In the following description, this posture is referred to as "reference posture". In this embodiment, the posture of the ink tank **25** when ink is supplied to the printing head part **32** when jetting the ink is the same as the reference posture. That is, the reference posture corresponds to one aspect of the liquid supply posture of the invention. In addition, in this embodiment, the posture of the ink tank **25** when ink is replenished to the ink tank **25** by a user is also the same as the reference posture.

In the ink tank **25**, the first face part **101** constitutes a bottom face part directed downward, and the second face part **102** constitutes a top face part directed upward (FIGS. **1** and **2**). A third face part **103** intersects the first face part **101** and the second face part **102**, and constitutes a front face part that faces the user when the lid part **22** of the casing part **21** is opened in the tank unit **20**. An outer wall part **107** constituting the third face part **103** corresponds to a subordinate concept of the first sidewall part in the invention. A fourth face part **104** intersects the first face part **101** and the second face part **102**, and constitutes a back face part that is directed in a direction opposite to the third face part **103**. The outer wall part **107** constituting the fourth face part **104** corresponds to a subordinate concept of the second sidewall part in the invention. The fifth face part **105** intersects the above four face parts **101** to **104**, and constitutes a left face part that is positioned on the left side in the front view of the third face part **103**. A sixth face part **106** intersects four face parts **101** to **104**, and constitutes a right face part that is positioned on the right side, which is an opposite side to the third face part **103**, in the front view of the third face part **103**. Note that in this specification, "two face parts intersect" means one of a state in which two face parts actually intersect each other, a state in which an extension plane of one of the face parts intersects another face part, and a state in which extension planes of two face parts intersect each other.

Next, the arrows X, Y and Z indicating the three directions that are based on the ink tank **25** will be described. The arrow X indicates a direction parallel to the width direction of the ink tank **25** (right-left direction), and indicates a direction from the fifth face part **105** toward the sixth face part **106**. In the following description, "right" means a side in the direction of the arrow X, and "left" means a side in a direction opposite to the direction of the arrow X. The arrow Y indicates a direction parallel to the depth direction of the ink tank **25** (front-back direction), and indicates a direction from the fourth face part **104** toward the third face part **103**. In the following description, "front" means a side in the direction of the arrow Y, and "back" means a side in a direction opposite to the direction of the arrow Y. The arrow Z indicates the height direction (up-down direction) of the ink tank **25**, and indicates a direction from the first face part **101** toward the second face part **102**. When the ink tank **25** is in the reference posture, the arrow Z is directed in a direction opposite to the gravity direction.

The ink tank **25** is provided with a case member **110**, a sheet member **111**, the cap member **112**, a pair of electrode pins **140***a* and **140***b*, and two sealing members **141** (FIG. **2**). The case member **110** is a hollow box body that constitutes the body portion of the ink tank **25**. The entirety of the sixth face part **106** side of the case member **110** is open in the direction of the arrow X, and the outer wall part **107** surrounding an internal space **110***s* of the case member **110** constitutes five face parts **101** to **105** excluding the sixth face part **106**. The case member **110** is produced by being integrally molded from synthetic resin such as nylon or polypropylene.

The sheet member **111** is a thin film-like member having flexibility, is joined so as to seal the entirety of the opening of the case member **110**, and constitutes the sixth face part **106** of the ink tank **25** (FIGS. **2** and **4**). The sheet member **111** is constituted by a film member formed of synthetic resin such as nylon or polypropylene. The sheet member **111** is joined to the case member **110** by welding, for example. In this manner, the body portion of the ink tank **25** of this embodiment is constituted by the case member **110** and the sheet member **111** so as to be simple and lightweight. Note that the fifth face part **105** side of the ink tank **25** may also be constituted by a sheet member joined to the case member **110** similarly to the sixth face part **106** side.

In the ink tank **25**, the internal space **110***s* of the case member **110** is provided with inner wall part **108** (FIGS. **2** and **3**). The inner wall part **108** has substantially the same height in the direction of the arrow X as the outer wall part **107**, and is welded to the sheet member **111** along with the outer wall part **107**. The internal space **110***s* surrounded by the case member **110** and the sheet member **111** is partitioned by the inner wall part **108** into the ink container **120** below and an atmospheric air introduction part **121** above.

The ink container **120** is a hollow section capable of storing the ink IN, and corresponds to a subordinate concept of the liquid container in the invention. In this embodiment, the ink container **120** is formed over the entirety of the ink tank **25** in the width direction and the front-back direction (FIGS. **3** and **4**). The atmospheric air introduction part **121** is a hollow section capable of storing atmospheric air (air) introduced from outside the ink tank **25** into the ink container **120**. The atmospheric air introduction part **121** is provided in an intermediate local range in the front-back

direction of the ink tank **25**. In this embodiment, the atmospheric air introduction part **121** protrudes upward approximately at a center of the ink tank **25** in the front-back direction. Accordingly, for example, even in the case where the ink tank **25** falls by mistake with the second face part **102** side down, the ink injecting part **113** and the electrode pins **140***a* and **140***b* to be described later are protected by the outer wall part **107** surrounding the atmospheric air introduction part **121**.

Here, among the wall parts constituting the ink container **120**, a wall part extending in a direction intersecting the gravity direction above the ink container **120** is referred to as "upper wall part **130**" (FIG. **2**). In this specification, "extend" means a state of continuously extending in a predetermined direction, and there may be a bending portion or a curved portion midway in the extending. In addition, a through hole, an uneven shape or the like may be formed. The upper wall part **130** has a first upper wall part **131**, a sidewall part **132**, and a second upper wall part **133**.

The first upper wall part **131** is constituted, at a position on the fourth face part **104** side relative to the atmospheric air introduction part **121**, by the outer wall part **107** extending in the direction of the arrow Y (FIG. **3**). The sidewall part **132** is constituted, laterally to the atmospheric air introduction part **121**, by the inner wall part **108** extending downward from the end of the first upper wall part **131** on the third face part **103** side. The second upper wall part **133** is bent from the sidewall part **132** and extends horizontally in the direction of the arrow Y. The second upper wall part **133** is constituted by the inner wall part **108** positioned below the atmospheric air introduction part **121**, and the outer wall part **107** positioned on the third face part **103** side relative to the atmospheric air introduction part **121** and extending in the direction of the arrow Y.

In this manner, in the upper wall part **130** of the ink container **120**, the first upper wall part **131** is positioned at a position higher than the second upper wall part **133**, the first upper wall part **131** and the second upper wall part **133** sandwiching a level difference formed by the sidewall part **132**. Accordingly, a recess **125** that is open downward in the gravity direction is formed above the ink container **120** on the fourth face part **104** side (FIGS. **2** and **3**). In the recess **125**, an upper wall part blocking the upper side (of the recess **125**) is constituted by the first upper wall part **131**, and a sidewall part blocking the lateral sides of the recess **125** is constituted by the sidewall part **132**, the outer wall part **107** and the sheet member **111** that are arranged on the periphery of the first upper wall part **131** (FIGS. **3**, and **4**). In this specification, "lateral side" of the recess means a direction intersecting a direction from the opening of the recess toward an end located in the farmost position of the recess. Note that in FIGS. **3** and **4**, the region of a recess space **120***s*, which is a space in the recess **125**, is illustrated with a dashed double-dotted line. The functions of the recess **125** in the ink tank **25** will be described later. Note that in this embodiment, the above-described wall parts **131**, **132**, **107** and **111** constituting the recess **125** correspond to a subordinate concept of the recess constitution wall part in the invention.

The second upper wall part **133** of the ink container **120** is provided with the ink injecting part **113** (FIGS. **3** and **4**). The ink injecting part **113** is a section that allows the ink container **120** to communicate with the outside so that the ink IN can be injected into the ink container **120**. The ink injecting part **113** corresponds to a subordinate concept of the liquid injection part in the invention. In this embodiment, the ink injecting part **113** is constituted as a cylindrical section having a through hole **113***h* that communicates with the ink container **120**, and protrudes upward from the second upper wall part **133**.

An ink injection port **135** is open at a section in which the through hole **113***h* of the ink injecting part **113** and the ink container **120** intersect. The ink injection port **135** is open in the second upper wall part **133**, and is positioned in a region outside the recess **125**. The ink injection port **135** corresponds to a subordinate concept of the liquid injection port in the invention. An ink intake port **137** is open in the top end face of the ink injecting part **113**. The ink intake port **137** corresponds to a subordinate concept of the liquid intake port in the invention.

Usually, the cap member **112** is attached to the upper end of the ink injecting part **113** in an airtight manner (FIG. **3**). The cap member **112** is inserted into the through hole **113***h* of the ink injecting part **113**, and has a section that tightly adheres to the inner wall surface of the through hole **113***h*. The cap member **112** is made of synthetic resin such as nylon or polypropylene. A user can replenish the ink container **120** with the ink IN as indicated by an arrow IP by removing the cap member **112** from the ink injecting part **113**. Note that in this embodiment, the ink injecting part **113** is formed at a position in the second face part **102** on the third face part **103** side that is closer to the third face part **103** than the fourth face part **104**. Therefore, when the ink tank **25** is mounted to the ink tank unit **20**, the user can easily access the ink injecting part **113**.

An ink supply part **117** is formed at the lower end of the ink container **120** on the fourth face part **104** side (FIG. **3**). The ink supply part **117** is a section that allows the ink container **120** to communicate with the outside such that the ink IN of the ink container **120** can be supplied to the printing head part **32** (FIG. **1**). In this embodiment, the ink supply part **117** is constituted as a cylindrical section having a through hole **117***h* that communicates with the lower end of the ink container **120**, and protrudes backward from the outer wall part **107** of the case member **110** at the lower end of the fourth face part **104**. The tube **26** connected to the printing head part **32** is connected to the ink supply part **117** in an airtight manner. Note that the ink supply part **117** may have a configuration in which the ink supply part **117** extends upward from the fourth face part **104** on the lower end side, and a mounting direction of the tube **26** is a direction opposite to the direction of the arrow Z.

The atmospheric air introduction part **121** communicates with the outside of the ink tank **25** via an atmospheric air intake part **124** (FIG. **3**). The atmospheric air introduction part **121** intakes external atmospheric air from the atmospheric air intake part **124**, as indicated by an arrow AI. In this embodiment, the atmospheric air intake part **124** is constituted as a cylindrical section having a through hole **124***h* communicating with the ink container **120**, and is provided in the outer wall part **107** of the atmospheric air introduction part **121** on the fourth face part **104** side. The atmospheric air intake part **124** may be provided in another section, and may be formed in the outer wall part **107** that is positioned above the atmospheric air introduction part **121** and constitutes the second face part **102**, for example.

In the inner wall part **108** constituting the second upper wall part **133** between the ink container **120** and the atmospheric air introduction part **121**, a communication path **127** is formed as a through hole passing through the inner wall part **108** (FIGS. **2** and **3**). Atmospheric air stored in the atmospheric air introduction part **121** is introduced into the ink container **120** via the communication path **127**. An atmospheric air introduction port **136** is open in a section in

which the communication path **127** of the atmospheric air introduction part **121** intersects the ink container **120** (FIG. **3**). That is, the atmospheric air introduction port **136** is open in the second upper wall part **133**, and is positioned in a region outside of the recess **125**. In the ink tank **25**, when the ink IN in the ink container **120** is consumed (arrow IS), the pressure in the ink container **120** becomes negative, and atmospheric air is introduced into the ink container **120** from the atmospheric air introduction part **121** via the atmospheric air introduction port **136**.

In the case member **110** of this embodiment, at least a part of or the whole wall part of the third face part **103** is constituted so as to be transparent or translucent such that a user can visually recognize the liquid surface of the ink IN in the ink container **120**. Thereby, the user can visually recognize the amount of ink stored in the ink tank **25** when replenishing the ink tank **25** with the ink IN or the like.

In the wall face of the third face part **103**, a mark part **116** is provided at a position lower than the upper wall face of the ink container **120** constituted by the second upper wall part **133** (FIGS. **2** and **3**). The mark part **116** is formed so as to indicate the position of the liquid surface of the ink IN when the ink IN of a predetermined reference amount is stored in the ink tank **25** that is in the reference posture. In the ink tank **25**, the maximum amount (reference amount) of the ink IN to be stored in the ink tank **25** is specified by the indication of the mark part **116**. The mark part **116** may be formed as a projection or a recess in the wall face of the third face part **103**, or may be formed by printing or attaching a sticker, for example.

In the ink tank **25** of this embodiment, a pair of electrode pins **140***a* and **140***b* are attached to the first upper wall part **131** of the ink container **120** (FIGS. **2** and **3**). The electrode pins **140***a* and **140***b* are constituted by conductive members extending in a bar-like shape. Two through holes **142***a* and **142***b* for inserting the electrode pins **140***a* and **140***b* are provided in the first upper wall part **131**.

The first electrode pin **140***a* is inserted into a first through hole **142***a*, and the second electrode pin **140***b* is inserted into a second through hole **142***b*. The cylindrical sealing members **141** are respectively embedded between the inner peripheral surface of the first through hole **142***a* and the first electrode pin **140***a*, and between the inner peripheral surface of the second through hole **142***b* and the second electrode pin **140***b*. Accordingly, fixability of the electrode pins **140***a* and **140***b* is enhanced, and airtightness of the ink container **120** is also enhanced.

The electrode pins **140***a* and **140***b* extend from the recess **125** that has been formed in the ink container **120** to a position short of the bottom face of the ink container **120** (FIG. **3**). The electrode pins **140***a* and **140***b* correspond to a subordinate concept of the electrode part of the invention. In addition, a section in the ink container **120** in which openings of the through holes **142***a* and **142***b* are formed corresponds to a subordinate concept of the section in the recess constitution wall part in which the electrode part is provided in the invention.

Top ends **143***a* and **143***b* of the electrode pins **140***a* and **140***b* are positioned, in the height direction, between the lower end of the ink container **120** and an intermediate position between the upper end and the lower end of the ink container **120** in the height direction. In this embodiment, the top end **143***a* of the first electrode pin **140***a* is positioned at a higher position than the top end **143***b* of the second electrode pin **140***b*. The top end **143***a* of the first electrode pin **140***a* may be positioned at a position at substantially the same height as the position of the top end **143***b* of the second electrode pin **140***b*.

In the printer **10** (FIG. **1**), the electrode pins **140***a* and **140***b* are connected to the ink detection part **34** via the circuit units **27**. When printing processing is being executed or printing processing has been suspended, the ink detection part **34** periodically applies a current to the first electrode pin **140***a*, and detects resistance between the first electrode pin **140***a* and the second electrode pin **140***b*. The resistance between the two electrode pins **140***a* and **140***b* increases when the ink IN in the ink container **120** is consumed, the liquid surface thereof descends to a position that is lower than the top end **143***a* of the first electrode pin **140***a*, and an electrical continuity between the ink IN and the first electrode pin **140***a* is shut off. When the resistance detected by the ink detection part **34** increases to a predetermined threshold or higher, the control unit **35** detects that the ink amount in the ink container **120** has fallen below a specified amount. Note that the ink detection part **34** may apply a current for detection of the ink IN to the second electrode pin **140***b* instead of the first electrode pin **140***a*. In addition, the control unit **35** may detect, as change in ink amount of the ink container **120**, change in resistance that corresponds to change in contact area of the electrode pins **140***a* and **140***b* with the ink IN.

Here, as described above, in the ink tank **25** of this embodiment, the electrode pins **140***a* and **140***b* are attached in the through holes **142***a* and **142***b* provided in the first upper wall part **131** that constitutes the upper end wall part of the recess **125** in the ink container **120** (FIG. **3**). In addition, the ink injection port **135** and the atmospheric air introduction port **136** that can be an atmospheric passage to the ink container **120** are provided outside the recess **125** (FIG. **4**), and in the recess **125**, there is no outlet that allows atmospheric air to flow out. Thus, for example, even in the case where the printer **10** as well as the ink tanks **25** are arranged to be inclined with respect to a horizontal plane, atmospheric air is retained in the recess space **120***s*, and the ink IN is restrained from reaching the through holes **142***a* and **142***b*. Similarly, even in the case where the ink IN is excessively replenished by the user, the liquid surface of the ink IN is restrained from reaching the recess **125** by atmospheric air retained in the recess **125**. Therefore, the ink IN is restrained from leaking to the outside of the ink tank **25** via the through holes **142***a* and **142***b*.

In the ink tank **25** of this embodiment, the sealing members **141** are arranged in the through holes **142***a* and **142***b*. With the ink tank **25** of this embodiment, as mentioned above, the ink IN is restrained from reaching a far position in the recess **125**, and thus the ink IN is restrained from adhering to the sealing members **141**. Therefore, deterioration of the sealing members **141** due to adhesion of the ink IN is restrained, and malfunctions such as decline in airtightness of the ink container **120**, decline in fixability of the electrode pins **140***a* and **140***b*, and leakage of the ink IN due to the deterioration of the sealing members **141** are restrained.

In addition, in this embodiment, the recess **125** is formed at a position of protruding above the ink container **120** (FIG. **3**). Thus, the ink IN is unlikely to reach the recess **125**, and intrusion of the ink IN into the recess **125** is further restrained. In addition, with the ink tank **25** of this embodiment, the second upper wall part **133** whose height position is lower than the first upper wall part **131** is provided in the upper wall part **130** of the ink container **120** in order to form the recess **125**. When a user replenishes the ink tank **25** with

the ink IN, it is possible to allow the user to recognize the wall face position of the second upper wall part **133** as the upper limit position of the ink IN in the ink container **120**. Therefore, the ink container **120** being replenished with an excessive amount of the ink IN is restrained. In this embodiment, because the mark part **116** is formed in the third face part **103**, the liquid surface of the ink IN is further restrained from reaching the recess **125**.

In the ink tank **25** of this embodiment, the through holes **142***a* and **142***b* are formed in the first upper wall part **131**, which is a blocked end of the recess **125** (FIG. **3**). Even if a portion of the ink IN has reached the wall face of the first upper wall part **131** due to flying or the like, the ink IN is subjected to an external force in a direction of falling from the first upper wall part **131** due to gravity. Therefore, even in the case where the ink IN has reached the wall face of the first upper wall part **131**, leakage of the ink IN from the through holes **142***a* and **142***b*, deterioration of the sealing members **141** due to adhesion of the ink IN, and the like are restrained.

In the ink tank **25** of this embodiment, the through holes **142***a* and **142***b* are at a position higher than the ink injection port **135** (FIG. **3**). Accordingly, the ink IN is restrained from reaching the through holes **142***a* and **142***b* from the ink injection port **135**, and the ink IN being injected from the ink injection port **135** is restrained from flying to the through holes **142***a* and **142***b*.

Furthermore, in the ink tank **25** of this embodiment, the ink injection port **135** is on the third face part **103** side, and the through holes **142***a* and **142***b* are on the fourth face part **104** side, in the ink container **120**. More specifically, the ink injection port **135** is positioned between the outer wall part **107** constituting the third face part **103**, and an intermediate position between the outer wall part **107** constituting the third face part **103** and the outer wall part **107** constituting the fourth face part **104**, in the front-back direction. In addition, the through holes **142***a* and **142***b* are positioned between the outer wall part **107** constituting the fourth face part **104**, and an intermediate position between the outer wall part **107** constituting the third face part **103** and the outer wall part **107** constituting the fourth face part **104**.

In this manner, in the ink tank **25** of this embodiment, the ink injecting part **113** and the through holes **142***a* and **142***b* are formed at positions that are spaced apart in the front-back direction, in the ink container **120**. Thus, the ink IN is further restrained from reaching the through holes **142***a* and **142***b* from the ink injection port **135**. Note that it is sufficient that a forming position of the ink injection port **135** is between the outer wall part **107** constituting the third face part **103**, and an intermediate position between the outer wall part **107** constituting the third face part **103** and the outer wall part **107** constituting the fourth face part **104**, and the forming position of the ink injection port **135** is not limited to a center position between the outer wall part **107** constituting the third face part **103** and the outer wall part **107** constituting the fourth face part **104** or the like. This can be applied to forming positions of the through holes **142***a* and **142***b*.

In the ink tank **25** of this embodiment, the electrode pins **140***a* and **140***b* extend in the gravity direction (FIG. **3**). Thus, the ink IN that adhered to the electrode pins **140***a* and **140***b* above the liquid surface of the ink IN is guided downward due to gravity. Therefore, a state in which excessive ink IN adheres to the electrode pins **140***a* and **140***b* is restrained, and decline in ink IN detection accuracy due to such adhesion of the ink IN is restrained.

Additionally, in the ink tank **25** of this embodiment, the ink intake port **137** of the ink injecting part **113** is at a position higher than the through holes **142***a* and **142***b* (FIG. **3**). Therefore, when the ink IN is replenished via the ink intake port **137**, ink droplets that flew out of the ink tank **25** are restrained from reaching the through holes **142***a* and **142***b*. Therefore, deterioration of the sealing members **141** due to adhesion of ink droplets, decline in ink detection accuracy due to a cause such as short-circuiting between the electrode pins **140***a* and **140***b*, and the like are restrained. In particular, in the ink tank **25** of this embodiment, the atmospheric air introduction part **121** protrudes upward above the ink intake port **137** between the ink injecting part **113** and the through holes **142***a* and **142***b*. Thus, a forming section of the atmospheric air introduction part **121** functions as a partition wall between the ink injecting part **113** and the through holes **142***a* and **142***b*, and ink droplets are further restrained from flying from the ink injecting part **113** to the through holes **142***a* and **142***b* outside the ink tanks **25**.

Summery

As described above, according to the ink tank **25** of the first embodiment, the through holes **142***a* and **142***b* for the electrode pins **140***a* and **140***b* are formed in the recess **125**, and thereby leakage of ink from the through holes **142***a* and **142***b* is restrained. Additionally, according to the ink tank **25** of the first embodiment, it is possible to exhibit the various actions and effects described above.

B. Second Embodiment

The configuration of an ink tank **25**A as a second embodiment of the invention will be described with reference to FIGS. **5** to **7**. FIG. **5** is a schematic exploded perspective diagram of the ink tank **25**A of the second embodiment. FIG. **6** is a schematic cross-sectional diagram of the ink tank **25**A of the second embodiment in a cross section taken along B-B shown in FIG. **5**. FIG. **6** schematically illustrates a state in which the ink IN is stored in an ink container **120**A and the cap member **112** has been removed from the ink injecting part **113**. FIG. **7** is a schematic top view diagram of the ink tank **25**A of the second embodiment when viewed in a direction opposite to the direction of the arrow Z. In FIG. **7**, parts of the internal structure is illustrated with broken lines.

The ink tank **25**A of the second embodiment has the same configuration as that of the ink tank **25** of the first embodiment except for the points described below, and is mounted to the printer **10** (FIG. **1**) that has the same configuration as that described in the first embodiment. In the following description and reference drawings, the same reference signs as those used in the first embodiment are used for constituent elements that are the same as or correspond to the constituent elements described in the first embodiment.

In the ink tank **25**A of the second embodiment, an upper wall part **130**A of the ink container **120**A horizontally extends in the front-back direction, and the internal space of the ink container **120**A has a substantially rectangular parallelepiped shape (FIGS. **2** and **3**). The ink container **120**A is provided with a partition wall part **150**. The partition wall part **150** extends downward from the upper wall part **130**A at a position between the third face part **103** and the fourth face part **104**. The partition wall part **150** is formed in a region on the fourth face part **104** side that is closer to the fourth face part **104** than the center of the ink container **120** in the front-back direction (FIG. **5**).

A lower end **151** of the partition wall part **150** is positioned between the upper wall part **130**A and the outer wall part **107** facing the upper wall part **130**A in the height direction and constituting the bottom wall part of the ink container **120**A. More specifically, the lower end **151** of the

partition wall part **150** is formed in a region on the upper wall part **130**A side that is closer to the upper wall part **130**A than the center of the ink container **120** in the height direction. The end of the partition wall part **150** on the fifth face part **105** side is coupled to the outer wall part **107** that constitutes the fifth face part **105** (FIG. **7**). In addition, the end face of the partition wall part **150** on the sixth face part **106** side is welded to the sheet member **111**, similarly to the outer wall part **107** and the inner wall part **108**.

In this manner, in the ink tank **25**A in the second embodiment, an upper region in the ink container **120**A is partitioned into two in the front-back direction by the partition wall part **150** (FIGS. **6** and **7**). Accordingly, a recess **125**A that is open downward in the gravity direction is formed in the upper region in the ink container **120**A on the fourth face part **104** side. In the recess **125**A, an upper end wall part blocking the upper side of the recess **125**A is constituted by the upper wall part **130**A that is positioned on the fourth face part **104** side relative to the partition wall part **150** (FIG. **6**). In addition, the sidewall part blocking the lateral side of the recess **125**A is constituted by the partition wall part **150**, the outer wall part **107** facing the partition wall part **150** and constituting the second face part **102**, the outer wall part **107** intersecting the partition wall part **150** and constituting the fifth face part **105**, and the sheet member **111** (FIG. **7**). In FIGS. **6** and **7**, the region of the recess space **120***s*, which is a space in the recess **125**A, is illustrated with a dashed double-dotted line. In the second embodiment, the above-described wall parts **130**A, **150**, **107** and **111** constituting the recess **125**A correspond to a subordinate concept of the recess constitution wall part in the invention. In this manner, according to the ink tank **25**A of the second embodiment, the recess **125**A is simply constituted in the ink container **120**A by adding the partition wall part **150**.

In the ink tank **25**A of the second embodiment, the through holes **142***a* and **142***b* for attaching the electrode pins **140***a* and **140***b* are provided in the upper wall part **130**A constituting the upper end wall part of the recess **125**A (FIG. **6**). Accordingly, the electrode pins **140***a* and **140***b* extend downward from the recess **125**A in the ink container **120**A. In addition, in the ink tank **25**A of the second embodiment, the ink injection port **135** and the atmospheric air introduction port **136** are provided in a region outside the recess **125**A, that is, a region on the third face part **103** side relative to the partition wall part **150** (FIG. **7**).

According to the ink tank **25**A of the second embodiment, even in the case where the ink tank **25**A is arranged to be inclined with respect to a horizontal plane, atmospheric air is retained in the recess **125**A, and intrusion of the ink IN into the recess **125**A is restrained, similarly to the ink tank **25** of the first embodiment. In addition, also when replenishing the ink IN, the liquid surface of the ink IN is restrained from reaching the inside of the recess **125**A due to the atmospheric air retained in the recess **125**A. Therefore, the ink IN is restrained from leaking to the outside from the through holes **142***a* and **142***b* for mounting the electrode pins **140***a* and **140***b*. Additionally, according to the ink tank **25**A of the second embodiment, it is possible to exhibit the same actions and effects as those of the ink tank **25** of the first embodiment.

C. Third Embodiment

The configuration of an ink tank **25**B as a third embodiment of the invention will be described with reference to FIGS. **8** to **10**. FIG. **8** is a schematic exploded perspective diagram of the ink tank **25**B of the third embodiment. FIG. **9** is a schematic cross-sectional diagram of the ink tank **25**B of the third embodiment in a cross section taken along C-C shown in FIG. **8**. FIG. **8**, a state in which the ink IN is stored in an ink container **120**B and the cap member **112** has been removed from the ink injecting part **113** is schematically illustrated. FIG. **9** is a schematic top view diagram of the ink tank **25**B of the third embodiment when viewed in a direction opposite to the direction of the arrow Z. In FIG. **9**, parts of the internal structure is illustrated with broken lines.

The ink tank **25**B of the third embodiment has the same configuration as that of the ink tank **25**A of the second embodiment except for the points described below, and is mounted to the printer **10** (FIG. **1**) that has the same configuration as that described in the first embodiment. In the following description and reference drawings, the same reference signs as those used in the first embodiment or the second embodiment are used for constituent elements that are the same as or correspond to the constituent elements described in the first embodiment or the second embodiment.

In the ink tank **25**B of the third embodiment, the partition wall part **150** is not provided in the ink container **120**B. Instead, in the ink tank **25**B of the third embodiment, a cylindrical wall part **155** constituted by a cylindrical wall part protruding upward is provided in an upper wall part **130**B of the ink container **120**B. The cylindrical wall part **155** is provided between the atmospheric air introduction part **121** and the end on the fourth face part **104** side. A through hole **155***h* in the cylindrical wall part **155** is open downward in the ink container **120**B, and the internal space of the cylindrical wall part **155** constitutes a portion of the ink container **120**B.

One upper end opening **156** is open at the upper end of the cylindrical wall part **155**. In the ink tank **25**B of the third embodiment, one substantially columnar sealing member **141**B is attached to the upper end opening **156** in an airtight manner. This sealing member **141**B has two through holes **157***a* and **157***b* passing through in the direction of the arrow Z. The first electrode pin **140***a* is inserted into a first through hole **157***a* in an airtight manner, and the second electrode pin **140***b* is inserted into a second through hole **157***b* in an airtight manner. The two electrode pins **140***a* and **140***b* are attached to the upper end opening **156** of the cylindrical wall part **155** in a state of having been attached to and integrated with a sealing member **141**B. According to this configuration, attachment of the electrode pins **140***a* and **140***b* is facilitated.

In the ink tank **25**B of the third embodiment, a recess **125**B is constituted by the cylindrical wall part **155**, in the upper region on the fourth face part **104** side in the ink container **120**B. In the third embodiment, the upper end wall part of the recess **125**B is constituted by the sealing member **141**B, and the sidewall part of the recess **125**B is constituted by the cylindrical wall part **155**. That is, in the third embodiment, the wall parts constituted by the sealing member **141**B and the cylindrical wall part **155** correspond to a subordinate concept of the recess constitution wall part in the invention. Note that similarly to the ink tank **25**A of the second embodiment, a configuration may be applied, to the ink tank **25**B of the third embodiment as well, in which the electrode pins **140***a* and **140***b* as well as the sealing members **141** are attached to two through holes provided at the upper end of the cylindrical wall part **155**.

In the ink tank **25**B of the third embodiment as well, similarly to the ink tank **25** of the first embodiment and the ink tank **25**A of the second embodiment, leakage of the ink IN from the through hole **155***h* for attaching the electrode pins **140***a* and **140***b* is restrained by providing the recess **125**B constituted by the cylindrical wall part **155**. In par-

ticular, in the ink tank **25**B of the third embodiment, a recess space **125***s* in the recess **125**B is constituted as a local space protruding upward from the ink container **120**B, and thus an effect of restraining intrusion of the ink IN into the recess space **125***s* is further enhanced. Additionally, according to the ink tank **25**B of the third embodiment, it is possible to exhibit the same actions and effects as those of the ink tank **25** of the first embodiment and the ink tank **25**A of the second embodiment.

D. Fourth Embodiment

FIG. **11** is a schematic cross-sectional diagram showing the configuration of an ink tank **25**C as a fourth embodiment of the invention. The cross-sectional position of the ink tank **25**C of the fourth embodiment in FIG. **11** is a position corresponding to the cross section taken along A-A shown in FIG. **2**. In FIG. **11**, a state in which the ink IN is stored in the ink container **120** and the cap member **112** has been removed from the ink injecting part **113** is schematically illustrated.

The ink tank **25**C of the fourth embodiment has the same configuration as that of the ink tank **25** of the first embodiment except for the points described below, and is mounted to the printer **10** (FIG. **1**) that has the same configuration as that described in the first embodiment. In the following description and reference drawings, the same reference signs as those used in the first embodiment are used for constituent elements that are the same as or correspond to the constituent elements described in the first embodiment.

In the ink tank **25**C of the fourth embodiment, the first upper wall part **131** constituting the upper end wall part of the recess **125** is provided at a height position that is substantially the same as that of the outer wall part **107** constituting the upper end of the atmospheric air introduction part **121**. Thus, the atmospheric air intake part **124** is provided at the upper end of the atmospheric air introduction part **121** in order to avoid interference with the forming region of the recess **125**.

In the ink tank **25**C of the fourth embodiment, the through holes **142***a* and **142***b* into which the electrode pins **140***a* and **140***b* are to be inserted are formed in the outer wall part **107** constituting the sidewall part of the recess **125** and constituting the fourth face part **104**. Thus, in the fourth embodiment, the electrode pins **140***a* and **140***b* are inserted in the direction of the arrow Y toward the ink container **120**, are bent downward in the recess **125**, and extend downward from the recess **125**. In the ink tank **25**C of the fourth embodiment, the circuit units **27** are arranged on the fourth face part **104** side.

In the ink tank **25**C of the fourth embodiment as well, similarly to the ink tank **25** of the first embodiment, leakage of the ink IN from the through holes **142***a* and **142***b* is restrained by providing the recess **125**. In addition, in the ink tank **25**C of the fourth embodiment, the through holes **142***a* and **142***b* are provided on the fourth face part **104** side. Therefore, outside the ink tank **25**C of the fourth embodiment, ink droplets that flew from the ink injecting part **113** are restrained from reaching the through holes **142***a* and **142***b*, when the ink IN is replenished from the ink injecting part **113** or the like. Additionally, with the ink tank **25**C of the fourth embodiment, it is possible to exhibit the same actions and effects as those of the ink tank **25** of the first embodiment.

E. Fifth Embodiment

FIG. **12** is a schematic cross-sectional diagram for describing the configuration of an ink tank **25**D as a fifth embodiment of the invention. In FIG. **12**, a schematic cross section of the electrode pins **140***a* and **140***b* at the mounting sections thereof in the ink tank **25**D of the fifth embodiment is illustrated. The cross-sectional position in FIG. **12** is a position corresponding to the cross section taken along A-A shown in FIG. **1**. The configuration of the ink tank **25**D of the fifth embodiment is substantially the same as that of the ink tank **25** of the first embodiment, except that the structure of the mounting sections of the electrode pins **140***a* and **140***b* is different.

In the ink tank **25**D of the fifth embodiment, a level difference part **131***s* is provided between the two through holes **142***a* and **142***b*, in a first upper wall part **131**D constituting the upper end wall part of the recess **125**. Accordingly, in the wall face of the first upper wall part **131**D that faces downward, the height position of the wall face on the second through hole **142***b* side is lower than the height position of the wall face on the first through hole **142***a* side.

By providing such a configuration, a distance L between the first through hole **142***a* and the second through hole **142***b* along the upper wall face of the first upper wall part **131**D increases by the size of the level difference part **131***s*. Therefore, even in the case where ink in the ink container **120** flies and adheres to the first upper wall part **131**D, occurrence of short-circuiting between the electrode pins **140***a* and **140***b* due to the ink is restrained. Additionally, with the ink tank **25**D of the fifth embodiment, it is possible to exhibit the same actions and effects as those of the ink tank **25** of the first embodiment. Note that the configuration of the level difference part **131***s* of the first upper wall part **131**D of the ink tank **25**D of the fifth embodiment may be applied to the ink tanks **25**A to **25**C of the above-described embodiments.

F. Sixth Embodiment

The configuration of an ink tank **25**E as a sixth embodiment of the invention will be described with reference to FIGS. **13** to **17**. FIG. **13** is a schematic exploded perspective diagram of the ink tank **25**E of the sixth embodiment on the third face part **103** side when viewed obliquely from below. FIG. **14** is a schematic exploded perspective diagram of the ink tank **25**E of the sixth embodiment on the fourth face part **104** side when viewed obliquely from above. FIG. **15** is a schematic cross-sectional diagram of the ink tank **25**E of the sixth embodiment at a junction face between the case member **110** and the sheet member **111**. In FIG. **15**, a state in which the ink IN is stored in an ink container **120**E is schematically illustrated. In addition, in FIG. **15**, an arrow indicating a flow of atmospheric air from the atmospheric air introduction part **121** to the ink container **120** is illustrated. FIG. **16** is a schematic cross-sectional diagram of the ink tank **25**E of the sixth embodiment in a cross section taken along D-D shown in FIG. **15**. FIG. **17** is a schematic top diagram of the ink tank **25**E of the sixth embodiment when viewed in the direction opposite to the direction of the arrow Z. In FIG. **17**, a state before the cap member **112** and the electrode pins **140***a* and **140***b* are attached is illustrated. In the following description and reference drawings, the same reference signs as those used in the above-described embodiments are used for constituent elements that are the same as or correspond to the constituent elements described in the above-described embodiments.

In the ink tank **25**E of the sixth embodiment, similarly to the ink tank **25** of the first embodiment, an opening part of the case member **110** on the sixth face part **106** side is sealed by the sheet member **111** that is welded thereto (FIG. **13**). At a position in the second face part **102** of the case member **110** on the third face part **103** side in the front-back direction, the ink injecting part **113** having a substantially

cylindrical shape is formed to protrude in the direction of the arrow Z. In the third face part **103** of the case member **110**, the mark part **116** is formed. At least a part of or the entire wall part of the third face part **103** of the case member **110** is constituted so as to be transparent or translucent. The internal space **110***s* of the case member **110** is partitioned into the ink container **120**E and an atmospheric air introduction part **121**E by the inner wall part **108** (FIGS. **13** and **15**).

The ink container **120**E is formed as a recess space opening in the direction of the arrow X in the case member **110** (FIG. **13**). A forming region of the ink container **120**E covers substantially the entire region of the ink tank **25**E of the sixth embodiment in the width direction and the front-back direction. An upper wall part **130**E of the ink container **120**E is constituted by the inner wall part **108** between the ink container **120**E and the atmospheric air introduction part **121**E. The upper wall part **130**E has a plurality of wall parts **231** to **235** (to be described in details) that are different in height position, extending direction and the like. A plurality of reinforcing ribs **109** erected in parallel to the direction of the arrow X are provided in the ink container **120**E. The reinforcing ribs **109** may be omitted.

Similarly to the ink container **120**E, the atmospheric air introduction part **121**E is formed as a recess space that is open in the direction of the arrow X in the case member **110**. The atmospheric air introduction part **121**E is formed along the outer periphery of the ink container **120**E on the second face part **102** side and the outer periphery on the fourth face part **104** side. The atmospheric air introduction part **121**E has six buffer chambers **201** to **206**, a first atmospheric air passage **211**, and a second atmospheric air passage **212**.

The six buffer chambers **201** to **206** are formed as hollow sections having a space having a substantially rectangular parallelepiped shape. The buffer chambers **201** to **206** have a function of retaining the ink IN, such that the ink IN that intruded from the ink container **120**E into the atmospheric air introduction part **121**E do not leak to the outside without being interrupted. Five buffer chambers **201** to **205** out of the six buffer chambers **201** to **206** have a depth in the direction of the arrow X that is substantially the same as the depth of the ink container **120**, and cover substantially the entire region in the direction of the arrow X. The sixth buffer chamber **206** is constituted to have a smaller depth in the direction of the arrow X than the other buffer chambers **201** to **205** in order to avoid interference with the ink injecting part **113**.

The two atmospheric air passages **211** and **212** are formed as grooves extending parallel to the surface of the sheet member **111**. Both the two atmospheric air passages **211** and **212** have a smaller depth in the direction of the arrow X than the six buffer chambers **201** to **206**. In the ink tank **25**E of the sixth embodiment, the buffer chambers **200** to **206** and the atmospheric air passages **211** and **212** are laid out as follows.

The first buffer chamber **201** and the second buffer chamber **202** are arranged adjacent to each other in the direction of the arrow Y, approximately at a center position of the second face part **102** in the direction of the arrow Y (FIG. **15**). The first buffer chamber **201** and the second buffer chamber **202** are formed such that the positions of the top faces of those chambers are aligned in the direction of the arrow Z and the positions of bottom faces of those chambers are aligned in the direction of the arrow Z. The first buffer chamber **201** and the second buffer chamber **202** are formed at a position overlapping the ink injecting part **113** when the ink tank **25**E of the sixth embodiment is viewed in the direction of the arrow Y. The top faces of the first buffer chamber **201** and the second buffer chamber **202** are at a position higher than the ink intake port **137** of the ink injecting part **113**.

The atmospheric air intake part **124** is connected to the upper end of the first buffer chamber **201**. The first buffer chamber **201** and the second buffer chamber **202** communicate with each other via a first communication port **221** formed at the lower end thereof. The second buffer chamber **202** is connected to the first atmospheric air passage **211** via a second communication port **222** formed at the lower end of the sidewall face on the side in the direction of the arrow Y.

The first atmospheric air passage **211** extends from the second communication port **222** over the first buffer chamber **201** and the second buffer chamber **202** along the outer peripheries of the second buffer chamber **202** and the first buffer chamber **201** to the end of the ink tank **25**E on the fourth face part **104** side. At the end on the fourth face part **104** side, the first atmospheric air passage **211** then makes approximately one reciprocal movement between the second face part **102** and the first face part **101** in the direction of the arrow Z. Furthermore, the first atmospheric air passage **211** extends in the direction of the arrow Y while being bent a plurality of times like bellows in the direction of the arrow Z, and is connected to the top face of the third buffer chamber **203**.

The third buffer chamber **203** is formed at a position at which the upper end thereof is adjacent to the lower end of the first buffer chamber **201** on the side in the direction opposite to the direction of the arrow Y. The fourth buffer chamber **204** is formed at a position adjacent to the lower end of the third buffer chamber **203** on the side in the direction of the arrow Y. The third buffer chamber **203** and the fourth buffer chamber **204** communicate with each other via a third communication port **223**. The height positions of the bottom faces of the third buffer chamber **203** and the fourth buffer chamber **204** are aligned.

The fourth buffer chamber **204** as well as the fifth buffer chamber **205** are formed at a stage below the first buffer chamber **201** and the second buffer chamber **202**. The fourth buffer chamber **204** and the fifth buffer chamber **205** are adjacent in the direction of the arrow Y in this order, and the positions of top faces of those chambers are aligned and the height positions of the bottom faces of those chambers are aligned. The fourth buffer chamber **204** and the fifth buffer chamber **205** communicate with each other via a fourth communication port **224** formed on the lower end. The positions of the ends of the fourth buffer chamber **204** and the first buffer chamber **201** on the fourth face part **104** side are aligned in the direction of the arrow Y. The positions of the ends of the fifth buffer chamber **205** and the second buffer chamber **202** on the third face part **103** side are aligned in the direction of the arrow Y.

The fifth buffer chamber **205** is connected to the second atmospheric air passage **212** via a fifth communication port **225** provided at the lower end of the sidewall face on the third face part **103** side. In the second atmospheric air passage **212**, the height position of a face at the lowest position and the height position of the bottom face of the fifth buffer chamber **205** are aligned. The second atmospheric air passage **212** extends in the direction of the arrow Y, and is connected to the sixth buffer chamber **206** via a sixth communication port **226**.

The sixth buffer chamber **206** is positioned at the end of the ink tank **25**E of the sixth embodiment on the third face part **103** side, and is formed at a position overlapping the

lower end of the ink injecting part **113** when the ink tank **25**E of the sixth embodiment is viewed in the direction of the arrow X.

The communication path **127** communicating with the ink container **120**E is formed at the end of the bottom face of the sixth buffer chamber **206** on the third face part **103** side. The communication path **127** is formed as a recess of the inner wall part **108** provided between the inner wall part **108** and the sheet member **111**. Atmospheric air taken into the first buffer chamber **201** via the atmospheric air intake part **124** reaches the sixth buffer chamber **206** via a route in the atmospheric air introduction part **121**E indicated by an arrow, and is introduced into the ink container **120**E via the communication path **127**.

The upper wall part **130**E of the ink container **120**E has a first upper wall part **231**, a first sidewall part **232**, a second upper wall part **233**, a second sidewall part **234**, and the third upper wall part **235** (FIG. **15**). The first upper wall part **231** is positioned at the end of the ink container **120**E on the side in the direction opposite to the direction of the arrow Y, and extends in the direction of the arrow Y on the lower side of a section of the first atmospheric air passage **211** that is bent like bellows. The first upper wall part **231** is positioned at the highest position in the upper wall part **130**E.

The first sidewall part **232** extends downward from the end of the first upper wall part **231** on the side in the direction of the arrow Y. The first sidewall part **232** constitutes a sidewall part of the third buffer chamber **203** on the side in the direction opposite to the direction of the arrow Y. The first sidewall part **232** also constitutes a level difference part between the first upper wall part **231** and the second upper wall part **233**.

The second upper wall part **233** extends from the lower end of the first sidewall part **232** in the direction of the arrow Y, and constitutes the bottom wall part of the fourth buffer chamber **204** and the fifth buffer chamber **205**. The second sidewall part **234** extends upward from the end of the second upper wall part **233** on the side in the direction of the arrow Y. The second sidewall part **234** constitutes a level difference part between the second upper wall part **233** and the third upper wall part **235**.

The third upper wall part **235** extends from the upper end of the second sidewall part **234** in the direction of the arrow Y, and constitutes the bottom wall part of the sixth buffer chamber **206**. The third upper wall part **235** is positioned at a height position that is higher than the second upper wall part **233** and lower than the first upper wall part **231**.

The third upper wall part **235** intersects the ink injecting part **113**, and the ink injection port **135** is open in the wall face of the third upper wall part **235** on the ink container **120**E side. The communication path **127** for communicating between the ink container **120**E and the atmospheric air introduction part **121**E is formed in the third upper wall part **235**. The atmospheric air introduction port **136** is open in the wall face of the third upper wall part **235** on the ink container **120**E side.

In the ink tank **25**E of the sixth embodiment, a recess **125**E is constituted by the first upper wall part **231** and the first sidewall part **232** as a part of the recess constitution wall part as follows. In FIGS. **15** to **17**, the region of the recess space **125***s*, which is a space in the recess **125**E, is illustrated with a dashed double-dotted line. The recess **125**E of the sixth embodiment is constituted by the first upper wall part **231** as the upper end wall part. In addition, the recess **125**E is constituted by the first sidewall part **232**, the outer wall part **107** that is on the fourth face part **104** side, the inner wall part **108** that partitions the ink container **120**E and the first atmospheric air passage **211**, the outer wall part **107** that is on the fifth face part **105** side, and the sheet member **111**, as sidewall parts. In the ink tank **25**E of the sixth embodiment, the pair of the electrodes **140***a* and **140***b* extend into the ink container **120**E via the recess **125**E as described below.

In the ink tank **25**E of the sixth embodiment, the pair of the electrode pins **140***a* and **140***b* are respectively inserted into the ink container **120**E via the through holes **142***a* and **142***b* of two cylindrical parts **240***a* and **240***b* that are provided so as to protrude upward in the second face part **102** (FIG. **14**). The two cylindrical parts **240***a* and **240***b* are arranged in the region above the second face part **102** on the fourth face part **104** side in the direction of the arrow X. A first cylindrical part **240***a* is positioned on the sixth face part **106** side, and a second cylindrical part **240***b* is positioned on the fifth face part **105** side.

In the ink tank **25**E of the sixth embodiment, the outer wall part **107** positioned above the first buffer chamber **201** and the second buffer chamber **202** protrudes upward between the ink injecting part **113** and the two cylindrical parts **240***a* and **240***b* (FIG. **15**). In addition, the height position of the upper end faces of the cylindrical parts **240***a* and **240***b* is higher than that of the ink intake port **137** in the ink injecting part **113**. Due to this configuration, in the ink tank **25**E of the sixth embodiment, ink droplets are restrained from flying from the ink injecting part **113** to the through holes **142***a* and **142***b* in the case where the ink IN is replenished or the like, similarly to the ink tank **25** of the first embodiment.

The two cylindrical parts **240***a* and **240***b* are provided above the first upper wall part **231** of the ink container **120**E (FIG. **17**). The through holes **142***a* and **142***b* of the two cylindrical parts **240***a* and **240***b* pass through the first upper wall part **231**, and reach the ink container **120**E (FIG. **16**). The first electrode pin **140***a* is inserted into the ink container **120** via the first through hole **142***a* of the first cylindrical part **240***a*. The second electrode pin **140***b* is inserted into the ink container **120** via the second through hole **142***b* of the second cylindrical part **240***b*.

The cylindrical sealing member **141** is arranged between the inner peripheral surface of the first through hole **142***a* and the first electrode pin **140***a*. The cylindrical sealing member **141** is also arranged between the inner peripheral surface of the second through hole **142***b* and the second electrode pin **140***b*. The sealing members **141** are exposed to the ink container **120**E at the first upper wall part **231**.

The ink tank **25**E of the sixth embodiment is provided with a first fixing member **240**, a second fixing member **242** and two screws **243** for fixing the pair of the electrode pins **140***a* and **140***b* (FIG. **14**). The first fixing member **240** and the second fixing member **242** each have two through holes, and are used for coupling the electrode pins **140***a* and **140***b* to each other by inserting the electrode pins **140***a* and **140***b* into the through holes.

The first fixing member **240** and the second fixing member **242** are arranged in a stacked state on the two cylindrical parts **240***a* and **240***b*, in the state where the electrode pins **140***a* and **140***b* are coupled to each other, the first fixing member **240** being on the upper side and the second fixing member **242** being on the lower side (FIGS. **14** and **16**). The first fixing member **240** and the second fixing member **242** are fixed, at the two ends thereof in the direction of the arrow X, to the case member **110** by the two screws **243**.

In this manner, in the ink tank **25**E of the sixth embodiment, the pair of the electrode pins **140***a* and **140***b* are inserted into the ink container **120**E via the through holes

142*a* and 142*b* provided in the first upper wall part **231** constituting the upper end wall part of the recess **125**E. Because atmospheric air is retained in the recess **125**E, intrusion of the ink IN is restrained, similar to the recess **125** described in the first embodiment. Therefore, in the ink tank **25**E of the sixth embodiment as well, leakage of the ink IN from the through holes **142***a* and **142***b*, deterioration of the sealing members **141** and the like are restrained, similarly to the ink tank **25** of the first embodiment.

In the ink tank **25**E of the sixth embodiment, the through holes **142***a* and **142***b*, the ink injection port **135** and the atmospheric air introduction port **136** are formed to be spaced apart in the direction of the arrow Y and sandwich the second upper wall part **233** protruding downward. The ink IN being replenished via the ink injection port **135**, the ink IN intruding into the atmospheric air introduction part **121**E and returning to the ink container **120**E from the atmospheric air introduction port **136** or the like is restrained from reaching the through holes **142***a* and **142***b*. Note that in the ink tank **25**E of the sixth embodiment, five buffer chambers **201** to **205** in the atmospheric air introduction part **121**E are provided above the second upper wall part **233**. In this manner, a region caused to protrude downward in order to form the recess **125**E is effectively used as an arranging region for the atmospheric air introduction part **121**E.

In the ink tank **25**E of the sixth embodiment, furthermore, a level difference part **231***s* is formed between the first through hole **142***a* and the second through hole **142***b*, in the first upper wall part **231** (FIG. **16**). Accordingly, in the first upper wall part **231**, the height position of the wall face on the first through hole **142***a* side is higher than the wall face on the second through hole **142***b* side. In the ink tank **25**E of the sixth embodiment, occurrence of short-circuiting between the electrode pins **140***a* and **140***b* due to adhesion of the ink IN to the first upper wall part **231** is restrained by the above-described level difference part **231***s*, similarly to the ink tank **25**D of the fifth embodiment (FIG. **12**).

As described above, with the ink tank **25**E of the sixth embodiment, leakage of the ink IN from the through holes **142***a* and **142***b*, deterioration of the sealing members **141** and the like are restrained by providing the recess **125**E. Additionally, with the ink tank **25**E of the sixth embodiment, it is possible to exhibit the same actions and effects as those of the ink tanks described in the above-described embodiments.

G. Modified Examples

G1. Modified Example 1

In the ink tanks **25** and **25**A to **25**E of the above embodiments, the recesses **125**, **125**A, **125**B, and **125**E are formed in an upper region facing the upper wall parts **130**, **130**A, **130**B, and **130**E of the ink containers **120**, **120**A, **120**B, and **120**E. However, the recesses **125**, **125**A, **125**B and **125**E do not need to be formed in the region above the ink containers **120**, **120**A, **120**B, and **120**E, and may be formed at a center position in the height direction, for example. In this case, the electrode pins **140***a* and **140***b* may be inserted from the outer wall part **107** constituting the fifth face part **105**, and bend and extend downward in the recess, in the same manner as the fifth embodiment, for example.

G2. Modified Example 2

In the ink tanks **25** and **25**A to **25**E of the above embodiments, the recesses **125**, **125**A, **125**B and **125**E are open in a direction parallel to the gravity direction. However, the recesses **125**, **125**A, **125**B and **125**E do not need to be open in a direction parallel to the gravity direction. It is sufficient that the recesses **125**, **125**A, **125**B and **125**E are open downward, and those recesses may be open obliquely downward, for example. In addition, the recesses **125**, **125**A, **125**B and **125**E do not need to be constituted such that the cross-sectional areas of those recesses are constant in the direction of the openings thereof, and for example, a configuration may be adopted in which the cross-sectional area decreases toward the opening.

G3. Modified Example 3

The ink tanks **25** and **25**A to **25**E of the above embodiments are provided with the two electrode pins **140***a* and **140***b* as the electrodes used for detection of ink. However, the electrodes used for detection of ink may have a shape different from that of the two electrode pins **140***a* and **140***b*. The electrodes used for detection of ink may have a plate-like or thin film-like shape, a band-like shape, a shape obtained by one of those shapes being complicatedly curved, or the like.

G4. Modified Example4

In the ink tanks **25** and **25**A to **25**E of the above embodiments, the two electrode pins **140***a* and **140***b* are partially inserted into the through holes **142***a* and **142***b*. However, the entirety of the two electrode pins **140***a* and **140***b* may be arranged in the ink container. In this case, conductive wires connected to the electrode pins **140***a* and **140***b* may be inserted in the through holes **142***a* and **142***b*. In this configuration, the conductive wires that are electrically conductive to the electrode pins **140***a* and **140***b* can be interpreted as a portion of the electrode part in the invention. In addition, the openings of the through holes **142***a* and **142***b* into which the conductive wires extend in the ink container **120** can be interpreted as a section in which the electrode part in the invention is provided.

G5. Modified Example 5

The ink tanks **25** and **25**A to **25**E of the above embodiments are provided with the two electrode pins **140***a* and **140***b* as a pair of electrodes. However, the ink tanks **25** and **25**A to **25**E of the embodiments do not need to be provided with the pair of electrodes, and may be provided with one electrode only, for example. In this case, only one electrode may be arranged in the ink container, and the other electrode may be arranged outside the ink tank in a state in which electrical continuity is secured using ink flowing into the tube **26** as a conductive path. In addition, the ink tanks **25** and **25**A to **25**E of the embodiments may be provided with two or more electrodes.

G6. Modified Example 6

In the ink tanks **25** and **25**A to **25**E of the above embodiments, the sealing members **141** are arranged between the electrode pin **140***a* and the through hole **142***a*, and between the electrode pin **140***b* and the through hole **142***b*. However, the sealing members **141** may be omitted. For example, the electrode pins **140***a* and **140***b* may be held in the through holes **142***a* and **142***b* in an airtight manner, by engaging projections provided on outer peripheries of the electrode pins **140***a* and **140***b* with projections or recesses provided on the inner wall surfaces of the through holes **142***a* and **142***b*.

G7. Modified Example 7

In the above embodiments, the reference posture, which is the posture when the ink tanks **25** and **25**A to **25**E are mounted to the printer **10**, the posture when ink is supplied to the printing head part **32**, and the posture when ink is replenished by a user are the same. However, the posture when ink is replenished to the printing head part **32** and the posture when ink is replenished by a user do not need to be the same as the reference posture. In this case, it is sufficient that the recesses **125**, **125**A, **125**B and **125**E are open

downward at least when the ink tanks **25** and **25**A to **25**E are in the posture when ink is supplied to the printing head part **32**.

G8. Modified Example 8

In the ink tanks **25**, **25**A, **25**B and **25**D of the above embodiments, both the ink injection port **135** and the atmospheric air introduction port **136** are formed as openings that are open in the upper wall face of the ink container **120**. However, the ink injection port **135** and the atmospheric air introduction port **136** do not need to be open in the upper wall face of the ink container **120**, and may be constituted as an opening of a pipe protruding from a wall face of the ink container **120**, for example. In addition, the ink injection port **135** and the atmospheric air introduction port **136** do not need to be open downward, and may be open in the horizontal direction, for example. It is sufficient that the ink injection port **135** and the atmospheric air introduction port **136** are open in a section excluding the recesses **125**, **125**A, **125**B and **125**E in the ink containers **120**, **120**A, **120**B, and **120**E.

G9. Modified Example 9

In the above embodiments, the ink tanks **25** and **25**A to **25**E are constituted by welding the sheet member **111** to the case member **110**. However, the ink tanks **25** and **25**A to **25**E do not need to be constituted by welding the sheet member **111** to the case member **110**. For example, the ink tanks **25** and **25**A to **25**E may be entirely constituted by a resin member made of a plastic or the like. Alternatively, the ink tanks **25** and **25**A to **25**E may be constituted by combining a container that constitutes the ink container **120** and a container that constitutes the atmospheric air introduction part **121**.

G10. Modified Example 10

The ink tanks **25** and **25**A to **25**E of the above embodiments have, in the third face part **103**, the mark part **116** indicating the position of the liquid surface of ink of a reference amount. However, the ink tanks **25** and **25**A to **25**E of the above embodiments do not need to have the mark part **116**. In addition, in the ink tanks **25** and **25**A to **25**E of the above embodiments, a portion of or the entire wall part constituting the third face part **103** is constituted so as to be transparent or translucent such that a user can visually recognize the liquid surface of the ink from outside. However, in the ink tanks **25** and **25**A to **25**E of the above embodiments, a part of or the entire wall part other than the wall part constituting the third face part **103** may be constituted so as to be transparent or translucent, or all the wall parts may be constituted so as to be opaque.

G11. Modified Example 11

In the ink tanks **25** and **25**A to **25**E of the above embodiments, the ink injecting part **113** and the through holes **142***a* and **142***b* are arranged in the front-back direction. However, the ink injecting part **113** and the through holes **142***a* and **142***b* may be arranged in the width direction, or may be arranged at positions diagonally sandwiching a center position of the ink containers **120**, **120**A, **120**B, and **120**E, when viewed in the direction opposite to the direction of the arrow Z.

G12. Modified Example 12

In the ink tanks **25** and **25**A to **25**E of the above embodiments, between the ink injecting part **113** and the electrode pins **140***a* and **140***b*, portions of the atmospheric air introduction parts **121** and **121**E protrude above the ink injecting part **113** and the electrode pins **140***a* and **140***b*. However, the atmospheric air introduction part do not need to protrude above the ink injecting part **113** and the electrode pins **140***a* and **140***b*. The atmospheric air introduction part may be formed below the ink injecting part **113** and the electrode pins **140***a* and **140***b*.

G13. Modified Example 13

The ink tanks **25** and **25**A to **25**E of the above embodiments are stored in the casing part **21** of the tank unit **20**. However, the ink tanks **25** to **25**E of the above embodiments may be stored in the casing part **31** of the printing part **30**. In addition, the ink tanks **25** to **25**E of the above embodiments may be connected to the printing part **30** in the state of being entirely exposed to the outside without being stored in those casing parts **21** and **31**, or in the state of being held by a basket-like holding member or the like.

G14. Modified Example 14

In the above embodiments, the ink tanks **25** and **25**A to **25**E store ink to be supplied to the printing head part **32** of the printer **10**. However, the configuration of the ink tanks **25** and **25**A to **25**E in the above embodiments may be applied to a tank that stores a liquid to be supplied to a liquid jetting system other than a printer. For example, the above configuration may be applied to a detergent tank for supplying detergent to a detergent jetting apparatus for jetting a liquid detergent.

The invention is not limited to the above embodiments, examples, and modifications, and can be achieved in various configurations without departing from the gist of the invention. For example, the technical features in the embodiments, examples, and modifications corresponding to the technical features in the modes can be replaced or combined as appropriate in order to solve a part of or the entire problem described above, or in order to achieve some or all of the aforementioned effects. A technical feature that is not described as essential in the specification can be deleted as appropriate.

The entire disclosure of Japanese Patent Application No. 2015-049479, filed on Mar. 12, 2015 is expressly incorporated herein by reference.

What is claimed is:

1. A tank configured to supply a liquid to a liquid jetting head that is configured to jet the liquid, the tank comprising:

a liquid container configured to store the liquid;

a liquid supply part configured to supply the liquid from the liquid container to the liquid jetting head;

a liquid injection part configured to inject the liquid into the liquid container via a liquid injection port that is open in the liquid container;

an atmospheric air introduction port;

an atmospheric air introduction part configured to introduce atmospheric air into the liquid container via the atmospheric air introduction port that is open in the liquid container; and

a terminal part stored in the liquid container and configured to detect the liquid in the liquid container,

the liquid container having a recess constitution wall part in which a recess is formed in the liquid container, the recess being open downward and having blocked upper and lateral sides while the tank is in a liquid supply posture in which the liquid is supplied to the liquid jetting head that is jetting the liquid, the recess constitution wall part being arranged at an upper portion of the liquid container while the tank is in the liquid supply posture,

the terminal part being attached to the recess constitution wall part, and

the liquid injection port and the atmospheric air introduction port being provided in a section excluding the recess, in the liquid container.

2. The tank according to claim 1,
wherein a posture of the tank when the liquid is injected into the liquid container via the liquid injection port is the same as the liquid supply posture.
3. The tank according to claim 1,
wherein a through hole that communicates with the outside of the liquid container and in which at least a portion of the terminal part is arranged, is provided in the recess constitution wall part, and
a sealing member that holds the terminal part is arranged between an inner peripheral surface of the through hole and the terminal part.
4. The tank according to claim 1,
wherein the liquid container includes:
an upper wall part that is positioned above the liquid container and extends in a direction intersecting the gravity direction when the tank is in the liquid supply posture;
a bottom wall part that is positioned below the liquid container, faces the upper wall part, and extends in a direction intersecting the gravity direction when the tank is in the liquid supply posture; and
a partition wall part that extends from the upper wall part to a position between the upper wall part and the bottom wall part so as to partition a space in the liquid container, and
the partition wall part is positioned, as a portion of the recess constitution wall part, lateral to the space in the recess.
5. The tank according to claim 1, further comprising:
a case member that is a box body that is open in one direction; and
a sheet member that is joined to the case member so as to seal the opening of the case member,
wherein the liquid container is positioned between the case member and the sheet member, and
an inner wall surface of the recess is constituted by an inner wall surface of the case member and a surface of the sheet member.
6. The tank according to claim 1,
wherein a sidewall of the recess that is a portion of the recess constitution wall part is constituted by a wall part of a cylindrical part protruding outward of the liquid container.
7. The tank according to claim 1,
wherein the terminal part is provided in an upper end wall part positioned on an upper side in the recess when the tank is in the liquid supply posture.
8. The tank according to claim 1,
wherein the terminal part is provided in a sidewall of the recess.
9. The tank according to claim 1,
wherein the terminal part is provided at a position higher than the liquid injection port in the recess when the tank is in the liquid supply posture.
10. The tank according to claim 1,
wherein the liquid injection part includes a liquid intake port that is open outward of the tank, and
the terminal part is provided at a position higher than the liquid intake port in the recess constitution wall part when the tank is in the liquid supply posture.
11. The tank according to claim 1,
wherein the recess constitution wall part includes a through hole that communicates with an outside of the tank, and the terminal part is arranged so as to pass through the through hole and extend from the liquid container to the outside of the tank.
12. The tank according to claim 1,
wherein the liquid container has an upper wall part that is positioned above the liquid container and extends in a direction intersecting the gravity direction when the tank is in the liquid supply posture, and
the upper wall part includes at least:
a first upper wall part that, when the tank is in the liquid supply posture, extends in a direction intersecting the gravity direction and is positioned, as a portion of the recess constitution wall part, above a space in the recess;
a sidewall part that extends downward from the first upper wall part and is positioned, as a portion of the recess constitution wall part, lateral to the space in the recess when the tank is in the liquid supply posture; and
a second upper wall part that is at a position lower than the first upper wall part and extends from the sidewall part in a direction that intersects the gravity direction and is a direction of separating from the recess when the tank is in the liquid supply posture.
13. The tank according to claim 12,
wherein the upper wall part further includes:
a third upper wall part that is positioned at a position higher than the second upper wall part and extends in a direction intersecting the gravity direction when the tank is in the liquid supply posture,
the third upper wall part is on an opposite side to the first upper wall part and sandwiches the sidewall part and the second upper wall part with the first upper wall part, and
the liquid injection port and the atmospheric air introduction port are formed so as to be open toward a region positioned below the third upper wall part when the tank is in the liquid supply posture.
14. The tank according to claim 1, further comprising:
a first sidewall part and a second sidewall part that face each other and sandwich the liquid container in a direction intersecting the gravity direction when the tank is in the liquid supply posture,
wherein the liquid injection port is positioned between the first sidewall part side and a center between the first sidewall part and the second sidewall part in a direction from the first sidewall part to the second sidewall part, and the terminal is provided in the recess constitution wall part between the second sidewall part side and the center between the first sidewall part and the second sidewall part.
15. The tank according to claim 14,
wherein at least a portion of the atmospheric air introduction part is positioned, in the direction from the first sidewall part toward the second sidewall part, between the liquid injection part and the section in the recess constitution wall part in which the terminal part is provided, and protrudes above the liquid injection part and the section in the recess constitution wall part in which the terminal part is provided when the tank is in the liquid supply posture.

* * * * *